THE IRON TRADE REVIEW

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Pig Market More Cheerful

And Buyers of Finished Materials Are Anxious to Contract— Mills Adopt Conservative Policy

Many buyers of finished materials, especially manufacturers of agricultural implements, are showing stronger desire to contract, but mills are very conservative in regard to contracting beyond the third quarter of the present year. They see nothing to be gained by making contracts for long periods at low prices and are anxious to be in a position to enjoy higher prices, which would probably accompany the increased demand which, it is confidently expected, will come at a later date. This attitude of sellers is illustrated particularly in the case of steel bars. While as low as 1.10c, Pittsburgh, has been done on prompt business, the usual quotation for third quarter is 1.15c, Pittsburgh, but for the fourth quarter 1.20c, Pittsburgh, is asked and, in some cases, has been obtained. The Philadelphia office of an independent company reports sales of 5,000 tons of bars in that district at 1.15c, Pittsburgh, for third quarter.

Pig Iron

Reports from nearly all centers are more cheerful as to sales of pig iron. In Chicago it is believed that the low point has been reached and makers are discouraging sales for delivery beyond the third quarter. The American Car & Foundry Co. has purchased about 4,000 to 5,000 tons of malleable and foundry grades for delivery at East St. Louis during the next four months. The Missouri Malleable Iron Co. has purchased from 4,000 to 5,000 tons of malleable for delivery during the last half, and a Chicago melter has taken 3,000 tons of high silicon iron. The principal sales of basic were 10,000 tons for last half delivery to the American Tube & Stamping Co., Bridgeport, Conn., and the same tonnage to the Gould Coupler Co., Depew, N. Y., for delivery during the next five months. A Harrisburg company is sounding the market on basic. Following the recent heavy buying of southern iron to a leading pipe company on the basis of $10.25, Birmingham, for No. 2, quoting at that figure has become more common for the third quarter and $10.50 is the usual quotation for last half delivery.

Cast Iron Pipe

The Central Foundry Co. was low bidder on 80,000 tons of cast iron segments for East River tubes, but the competition was keen and it is not certain that the contract will be awarded to this company. Awards of cast iron pipe during the past week have been light.

Sheets and Plates

Very active competition in sheets has recently developed some low quotations, especially on blue annealed. Some makers are refusing to meet the prices recently named. Leading plate makers report heavier specifications, but business has not improved to such an extent as to justify any increase in mill activities. The Standard Oil Co. has increased its order for tin plate to 750,000 boxes.

Coke

During May, 5,000 ovens were put out of commission in the Connellsville coke regions, where only about half of the ovens are now in operation. Production for the week ending May 30 was 244,028 tons, a decrease of 13,602 tons, compared with the preceding week.

Iron Ore

The first cargo lot of Chilean ore from the mines of the Bethlehem Steel Co. has been delivered at Philadelphia, it being 6,000 tons for the Bethlehem company, which has arranged to ship 750,000 tons in European ships during the next two years. The Lake Superior iron ore market still drags and furnaces are taking risks of not getting the ore which they will need for their mixtures, as mines are being shut down and shipments sharply reduced.

THE OPEN HEARTH

Tell 'Em to Go Home

PRESIDENT WILSON describes the present dullness of business as "psychological". For purposes of mere description, this term is about as expressive as any other, if it conveys the impression of a listlessness of action, a lack of initiative, an indifference to usually favorable factors and, moreover, an underlying fear, insidious, perhaps not fully justified, but none the less distinct and effective —in other words, a loss of confidence.

The present mental attitude of business, whatever it may be called, did not spring up in a day, or from any one particular cause. It is the result of the release of a flood of agitation and laws pertaining to commercial affairs, some of it good, some of it unnecessary, some of it vicious; to uncertainty over existing regulative statutes; to sharp changes in the nation's fiscal and economic systems and to other radical innovations, all of which the business world has been asked to accept and assimilate within a brief period of time and still maintain its vigor.

The patient is being asked to override all natural laws—to gorge itself with more nostrums than it has the capacity to stand. It looks like a case of over-trained digestion with a resulting depression, mentally. The stage has been reached where a cure most urgently is demanded. Nothing could be more helpful than a period of rest from fresh disturbance and a breathing spell wherein an inherently vigorous constitution may restore composure and confidence.

The best act President Wilson can perform for the business situation of the country is to use his good offices to shut off at this time the supply of the very thing that is gagging and choking business—in other words, get Congress adjourned.

The question has often been asked recently why shipments in the Cincinnati district are going forward at a satisfactory rate with very few suspensions, when the market in that territory has been exceedingly dull for a long time, with sales and inquiries limited to light tonnages. The explanation is that buyers have adopted the "hand-to-mouth" policy, which means that they are contracting ahead for only a few weeks or perhaps months at a time as their requirements actually demand, preferring to wait until conditions become more settled before closing for large lots. These smaller tonnages are taken only when needed, and naturally no suspensions are likely to result. Since a large part of the iron being sold today is going to just such buyers, it is easy to see that furnaces are being kept reasonably busy with shipments on such orders. The general output of the furnaces has been reduced almost proportionately with the demand since the first of the year, and as they occasionally receive large orders, not as much iron is being piled at the present time as would be estimated without careful consideration. Similar conditions prevail in other districts.

Railroad or Device for Rebating?

IN THE mass of recent investigations and decisions of the Interstate Commerce Commission, of more or less interest to the iron and steel producers, there is one matter of great importance to that industry. We refer to the industrial railroad situation. As a result of the action of the federal regulative body and various state commissions, the status of the industrial railroads of the steel plants is enveloped by uncertainty.

It is interesting to see how this situation was brought about. For a long time the Commission had been coming to the conclusion that the railroads of this country were wasting many millions of dollars in special services for which they were not being adequately paid and thus were dissipating their revenues. In the course of investigations as to all phases of this subject, the Commission has centered upon the allowances to privately owned railroads connected with industrial plants as one of the chief examples of waste in railroad management.

So deeply concerned about these allowances has the Commission become that it has gone so far as to say that a railroad which is owned by the industry which it serves is not a rail-

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road at all, that the service which it performs in hauling freight to and from the plants is not even to be considered as transportation service and finally that any allowances to a railroad owned by a plant as to products shipped by that plant is simply a common, ordinary rebate. This view of the Commission originated in its desire to condemn and prevent discriminations wherever it found them to exist, whether between different classes of traffic or between different communities or different shippers. The prevention of unjust discriminations is the chief function of the Commission and its efforts in this direction are but the performance of the duty imposed upon it by Congress. But the question arises whether in the present instance the Commission has, in its zeal for condemning discriminations, misinterpreted the language of the interstate commerce act defining "railroads" and "transportation".

As pointed out by THE IRON TRADE REVIEW in a previous issue, the decision of the Supreme Court of the United States in the Mitchell Coal & Coke Co. case, holding that a privately owned railroad running to a coal mine can well be given an allowance out of the through rate, because it is performing part of a transportation service, cannot be reconciled with the ruling of the Commission that the hauling of freight from a trunk line to a steel plant cannot be considered transportation service. Now comes another decision of the Supreme Court in the tap line cases, in which it is held that a tap line of a lumber company is no less a common carrier because it happens to be owned by the lumber company whose products it is hauling. Here again the Supreme Court has over-ridden one of the fundamental principles upon which the Commission has condemned the industrial railroads as not being common carriers. If the service of a spur track into a coal mine is properly to be regarded as a part of the transportation service and if an industrial railroad to a lumber mill is just as much a common carrier whether owned by the lumber company or someone else, what is left of the decision of the Commission that industrial railroads to steel plants cannot lawfully receive allowances because they are owned by the steel plants and the services which they perform are not to be regarded as transportation services?

To further complicate the situation, a number of state commissions have taken the view that seems to be indicated by the decisions of the Supreme Court and have held that steel plant railroads are common carriers and perform a transportation service and may therefore be given allowances. It thus results that the same industrial railroad is a common carrier performing transportation services with all that implies so far as the state is concerned, and is a mere device for rebating so far as the Interstate Commerce Commission is concerned.

This leaves the owners of such railroads in a quandry and it is hardly likely that the matter will be left to rest in such an uncertain state. Though the federal commission has indicated by its refusal to re-open the industrial railways case that it will not recede from its position, an effort is being made by an action in the District Supreme Court in Washington to compel the Commission to issue such an order, so that appeal will lie ultimately to the Supreme Court of the United States, where this vexed question should finally be settled.

It would seem to the lay mind that the Supreme Court of the United States has at least hinted at a solution of the whole question when it says in effect that the Interstate Commerce Commission has gone too far in holding that tap lines or coal mine spur tracks are not common carriers and do not perform transportation services, but that this should not for a moment be considered as preventing the commission from the fullest exercise of its power to prevent discriminations and rebates by fixing absolutely the proper and non-discriminatory charge that should be made by these railroads just as it may do as to the charges of all railroads for all services. The end aimed at is the prevention of unreasonable and discriminatory charges. This can be done by a careful regulation of the allowances given to industrial railroads, so that unreasonableness, discrimination and rebating will be eliminated.

Prices Present and Past

Quotations on leading products today, average for last month, average for three months ago and average for June, 1913. Prices are those ruling in the largest percentage of sales at the dates named.

	Today's prices.	Average for May, 1914.	Average for March, 1914.	Average for June, 1913.
Bessemer pig iron, Pittsburgh..	$14.90	$14.90	$15.15	$17.26
Basic pig iron, Pittsburgh.....	13.90	13.90	13.96	15.46
No. 2 Fdy. pig iron, Pittsburgh	13.90	14.09	14.15	15.04
Northern No. 2 Fdy.. Chgo....	14.25	14.25	14.25	16.00
Lake Superior Charcoal, Chgo..	16.00	15.75	15.50	16.75
Malleable Bessemer, Chicago...	14.25	14.25	14.25	15.75
Southern No. 2, Birmingham...	10.25	10.50	10.50	10.70
Southern Ohio No. 2, Ironton.	13.50	13.50	13.50	14.70
Basic, eastern Pa.....	14.00	14.00	14.25	16.00
No. 2X Virginia furnace.....	12.75	12.75	12.75	13.75
No. 2X Foundry, Philadelphia.	14.75	15.00	15.00	16.25
Ferro manganese, Baltimore....	38.00	38.00	38.50	61.00
Bessemer billets, Pbgh. & Ygn.	20.00	20.00	21.00	26.50
Op. h'th billets, Pbgh. & Ygn..	20.00	20.00	21.00	26.50
Bess. sheet bars, Pbgh. & Ygn.	21.00	21.00	22.00	27.50
Op. h'th sh. bars, Pbgh. & Ygn.	21.00	21.00	22.00	27.50
Steel bars, Pittsburgh.....	1.12½	1.15	1.20	1.40
Iron bars, Philadelphia.....	1.20	1.22	1.25	1.52
Steel bars, Chicago.....	1.28	1.29	1.38	1.58
Tank plates, Chicago.....	1.28	1.29	1.38	1.63

	Today's prices.	Average for May, 1914.	Average for March, 1914.	Average for June, 1913.
Structural shapes, Chicago.....	$1.28	$1.29	$1.43	$1.63
Iron bars, Cleveland.....	1.20	1.25	1.30	1.65
Iron bars, Chgo. mill.....	1.10	1.10	1.57	1.55
Beams, Pittsburgh	1.12½	1.25	1.30	1.60
Beams, Philadelphia	1.25	1.30	1.30	1.60
Tank plates, Pittsburgh.....	1.10	1.12½	1.20	1.45
Tank plates, Philadelphia.....	1.25	1.25	1.30	1.75
Sheets, blk., No. 28, Pittsburgh	1.85	1.87	1.95	2.28
Sheets, blue an., No. 10, Pbgh.	1.35	1.37	1.40	1.75
Sheets, galv., No. 28, Pbgh....	2.75	2.80	2.95	3.39
Wire nails, Pittsburgh.....	1.50	1.57	1.60	1.78
Connellsville fur. coke, contr...	1.85	2.00	2.00	2.25
Connellsville fdy. coke contr...	2.40	2.50	2.50	3.00
Heavy melting steel, Pbgh.....	12.00	12.00	12.00	13.06
Heavy melting steel, east'n Pa.	10.75	10.75	11.25	12.50
Heavy melting steel, Chgo.....	9.75	9.95	9.80	12.00
Heavy cast, eastern Pa.....	12.50	12.50	13.00	13.50
No. 1 wrought, eastern Pa.....	12.50	12.50	14.50	15.50
No. 1 wrought, Chgo.....	8.75	8.63	9.00	11.25
Rerolling rails, Chgo.....	11.25	11.25	11.25	14.00
Car wheels, Chgo.....	11.25	11.38	11.75	17.00

(For Additional Prices See Page 1070.)

Pig Iron Market Looking Upward

In the Chicago District—Getting Away from the Lowest Recent Prices—Fair Activity in the East

At Chicago, indications are that the low point in pig iron sales has been passed and conditions are on the upgrade. Two sales of considerable tonnage within the past week indicate no more pig iron is obtainable at the price made on a large tonnage of basic several weeks ago. Inquiry is consistently heavier and while not all of it is expected to lead to contracts immediately, a sufficient tonnage is being booked for third quarter to give the market a much more active appearance. Smaller melters, whose business has been slack throughout the first half and who have deferred tonnage to be delivered in second half, are testing out the market and booking some forward tonnages, although not the normal quantity.

Makers in the Chicago district are discouraging contracts beyond third quarter, although considerable inquiry is seeking tonnage for full last half. Some makers refuse to quote for fourth quarter and others are asking sufficient advance to discourage inquirers.

The American Car & Foundry Co. has just closed for between 4,000 and 5,000 tons of malleable and foundry iron for delivery during the next four months at its East St. Louis plant. The Missouri Malleable Iron Co. has bought between 4,000 and 5,000 tons of malleable iron to be delivered over last half. The price paid for this iron is considerably higher than was realized on previous heavy sales of basic into the same territory.

A Chicago melter has closed for 3,000 tons of high silicon iron, running as high as 10 per cent silicon, and 5,000 tons of foundry and malleable.

A sale of southern foundry pig iron was made recently to a Chicago melter, the first sale of any considerable tonnage of southern iron in Chicago proper for some time. This consisted of two lots from separate sellers, of 500 tons each, for delivery over third quarter. This is understood to have been at $14.60, delivered, Chicago. The Allis-Chalmers Mfg. Co. has closed recently for 700 to 800 tons, mostly southern foundry iron, for its Cincinnati plant.

The schedule for southern iron adhered to by most dealers is $14.60, delivered Chicago, for third quarter, and $14.85, delivered Chicago, for last half. Some furnaces will not quote on last quarter, believing prices will be better by that time, and others are willing to take a moderate tonnage at $14.85, delivered, Chicago.

A sale of 1,000 tons of English hematite iron has been made for delivery to San Francisco. On the Atlantic coast, English hematite is quoted from $18.50 to $21, tidewater, according to quality. Domestic buyers at present seem little interested in such offers.

In the Cleveland district, dullness in the market continues but shipments are going forward to foundries fairly well. An interesting feature of the market is the fact that sellers who are asking $13.50, valley, for their iron, such as Cherry Valley, are selling right along, but a considerable percentage of the iron being disposed of is going at $13.

Valley Pig Reflects Better Tone

Sales of foundry, malleable and gray forge irons by furnaces in the valleys and the Pittsburgh district the last 10 days have involved fairly heavy tonnages. A prominent consumer has quietly closed for about 20,000 tons of gray forge iron, and sales of foundry and malleable irons have involved about 2,000 tons. Leading valleys sellers are asking $13.50, furnace, for No. 2 foundry and malleable, but both grades can be laid down in Pittsburgh at $13.90. The Gould Coupler Co., Depew, N. Y., has taken 10,000 tons of basic for shipment at the rate of

(*For complete prices see page* 1070.)

2,000 tons a month over the next five months. The tonnage was not placed with valley or Pittsburgh interests, so far as can be learned. An inquiry for 4,000 tons of basic for nearby shipment to a mill in this district has come out.

Fair Activity in East

Covering of forward requirements of pig iron by consumers at Philadelphia and vicinity continues at the modest though somewhat more active rate of recent weeks. The recent heavy buying of southern iron by the United States Cast Iron Pipe & Foundry Co. fully referred to last week, the regulations for which were carried on at Philadelphia, has not developed any further transaction made by this customer. It is understood, however, some negotiations with southern makers continue and may result in the purchase of additional blocks of southern Alabama metal. The low grade iron for early and third quarter delivery taken by the leading pipe maker was at $9.25, Birmingham, for forge equivalent to $13.45 at its Delaware River plant, though not much of the metal is expected to come there. On a No. 2 basis, this means $10.25, Birmingham, as reported. Another pipe maker in the Delaware river district has taken 1,000 tons of southern forge at $9.50, Birmingham, or $13.70 delivered. Some lots of northern pipe forge recently were sold at $13.75 delivered. A Trenton radiator manufacturer has purchased 1,500 tons of No. 2 plain from two eastern Pennsylvania at $14.70, delivered, or $14, furnace. The Norfolk & Western railroad is inquiring for 600 tons of Bessemer, 450 tons of charcoal and 925 tons of Nos. 1, 2 and 3 foundry, third quarter, for Roanoke, Va. Northern foundry remains at $14.75 to $15, Philadelphia, for No. 2X. Virginia iron has weakened to $12.75 furnace for No. 2X for third quarter or last half. This has been the second quarter and prompt price, but makers have been asking $13 beyond July 1. In steel making lines, a Harrisburg works which recently was reported to have bought a lot of basic is inquiring informally for this grade for third quarter and last half. Eastern basic remains quoted at $14, delivered. Some negotiations for low phosphorus iron are under way including up to 4,000 tons for last half for a Philadelphia steel maker, 1,000 tons for western shipment and some other tonnage. The low phosphorus market has not been tested recently. May statistics of the Eastern Pig Iron Association show that orders of eastern furnaces increased largely in that period, due principally to basic buying and that stocks were unchanged in all but one case where special conditions obtained.

Total iron sales, the past week, in territory contiguous to the New York City market, were about 20,000 tons, the best showing in some time. The largest transaction was about 10,000 tons of basic for last half for the American Tube & Stamping Co., Bridgeport, Conn., which went to a New Jersey furnace at about $14.25, delivered. A Paterson, N. J., buyer took 900 tons of 2.75 to 3.25, silicon iron for third quarter, at a shade below $14.75, delivered, which is reported to have been resale Buffalo metal and 900 tons of 2 to 2.50 silicon from an eastern Pennsylvania furnace at around $14.25, delivered. Other sales include 800 tons to a Jersey City stove maker; 500 tons to a Newark furnace manufacturer; 500 tons to another buyer, and miscellaneous orders. While new inquiry has not been quite so good the past few days, considerable tonnage is current. New inquiries include 3,000 tons of low phosphorus for a consumer in the metropolitan district; 2,000 tons of Nos. 2 plain and 2X for a Poughkeepsie, N. Y., implement manufacturer, and other lots in addition to several round quantities being figured quietly and other matters which have been pending for some days. Action on iron requirements for the East River tube contract is expected shortly. Tidewater prices are little changed, but $14.75 for No. 2X was shaded slightly in the week. Buffalo makers hold to $13, furnace, for No. 2X, or $14.75, delivered at the most favored Jersey points.

Buffalo Sales 25,000 Tons

The furnaces of the Buffalo district booked orders during the week for 25,000 tons, leading any week's total in the past three or four months. The improvement in inquiry noted is more general in character and broadening. Producers feel that the demand will undergo a general and gradual improvement from this time on, as melters are manifesting an interest in both their present and nearby needs.

There is a disposition on the part of some of the users to assume a more optimistic attitude because of the slightly better business they are securing. The foundries in general of the district are inclined towards optimism, even though they have not as yet felt any marked change in market conditions. The prospects of an early settlement of the railroad rate question, coupled with the bumper grain crop reports of the government have a bearing on strengthening their hopes for an improved general market. Prices have not varied in the past week.

Better Inquiry at Cincinnati

The market in the Cincinnati district is showng more life than for many months. Inquiry is considerably better, but prices are a little weaker. Following sales of about 75,000 tons of iron to the United States Cast Iron Pipe & Foundry Co. by southern furnaces recently at $10.25, Birmingham basis, for No. 2 foundry, one and possibly two furnaces are now offering this same grade at $10.25, Birmingham basis, in this territory for third quarter shipment. The majority of furnaces are still holding at $10.50, Birmingham basis, for No. 2 foundry, for prompt shipment or delivery through the last half.

Southern Ohio iron is holding at $13.50, Ironton, for No. 2 foundry, although melters have been trying to break this price for more than a month. It is certain that furnaces in the Ironton district could sell considerable iron if they would accept business at a lower figure.

Among inquiries here is one for about 2,000 tons of northern foundry iron from the Hercules Gas Engine Co., Evansville, Ind. The heaviest sales during the past week have been mostly in southern territory, but the general inquiry is widely scattered.

More Cheerful in South

Following the recent heavy buying movement in which pig iron sales in a day or two aggregated 100,000 tons for third and fourth quarter delivery, more cheerfulness is noted in the Birmingham district. While one large pig iron maker in this district is credited with securing about 35,000 tons of the United States Cast Pipe order and another maker got about 17,000 tons, it is declared the prices involved in the large purchases were $10.25 and $10.50, Birmingham, for No. 2 foundry. Furnacemen now declare that none of the several smaller sales that have been made since have involved prices lower than $10.50 to $10.75.

Since several Birmingham offices have been placing fair-sized orders almost every day for the past week, it would seem the actual total of sales for the past eight or ten days would reach between 150,000 and 175,000 tons.

No material increase in furnace activity is looked for in the immediate future, however, as yard stocks in most instances are heavy and will easily stand big shipments. One Birmingham office states that there was more inquiry from the middle west and central states the past week than in four or five months. The great percentage of present inquiry, it is said, is for third quarter delivery. Nearly all sales of the past week have been for third quarter delivery and furnace men say this indicates buyers are in the market for immediate needs. Furnaces are holding out for fourth quarter delivery at $11.

(*For complete prices see page* 1070.)

Must Soon Order Ore

Or Stand Chance of Not Getting Desired Grades—Heavy Grain Movement Assured

The ore movement to June 1 is not quite 50 per cent of that for the corresponding period last year. The figures are 4,121,749 tons as against 8,150,599 tons, a decrease of 4,028,850 tons. About 77 per cent of the vessels enrolled in the Lake Carriers' Association are now in commission and the trade is improving slowly. Not all these vessels, however, are getting cargoes regularly and the movement to July 1 will show a severe slump. The stage, however, is being set, as it never was set before, for a most active fall. Furnace men cannot much longer delay ordering the mixtures they require if they want to be assured of delivery. The trade has received so great a set back in the movement of bulk commodities that even a movement of only 32,000,000 tons of ore for the season will work out at approximately last year's movement of all bulk cargoes during the remaining months of the year, for there is absolute certainty of a movement of grain exceeding that of last year, which was the heaviest on record, and the further fact that the usual quota of coal will have to go into the northwest—all jammed into the fall months. Further delay is therefore dangerous.

Lake Superior iron ore shipments totaled 3,852,063 tons during May, a decrease of 3,432,149 tons from the corresponding month last year. Shipments by ports were as follows:

Port.	May, 1913.	May, 1914.
Escanaba	738,158	385,188
Marquette	489,547	121,873
Ashland	681,460	300,928
Superior	2,047,396	1,673,269
Duluth	1,939,848	734,090
Two Harbors	1,387,803	636,715
	7,284,212	3,852,063
1914 decrease		3,432,149

Port.	To June 1, 1913.	To June 1, 1914.
Escanaba	955,187	495,917
Marquette	527,041	121,873
Ashland	734,941	341,766
Superior	2,300,271	1,735,607
Duluth	2,100,220	734,090
Two Harbors	1,532,939	692,496
	8,150,599	4,121,749
1914 decrease		4,028,850

Chilean Ore Arrives

The British steamer Epsom arrived at Philadelphia June 7 with the first cargo lot of Chilean ore ever shipped to this country, which was obtained from the mines of the Bethlehem Steel Co., at Cruz Grande, and is consigned to that company. The shipment amounted to about 6,000 tons and was en route 46 days. It is announced that the Bethlehem Steel Co. has effected freight arrangements with European ship owners, whereby it will bring to this country during the next two years 750,000 tons of Chilean ore. This contract will run prior to the putting into service in this traffic two years hence a fleet of especially-constructed ore carriers, which now is building, to carry out a long-term transportation contract recently made by the Bethlehem company with Swedish transportation interests, as previously reported. Ore buying in the east remains extremely light.

Eastern Buyers

Show Little Interest in the Billet Market

While billet consumers having contracts with eastern Pennsylvania makers are specifying for full amounts and apparently are accumulating no stocks, they are showing scant interest in their needs beyond July 1, when their present orders expire. One large seller reports only one buyer has inquired regarding a last half contract. Sooner or later, considerable activity in renewing the expiring contracts is expected. New business for early delivery also is small in the eastern Pennsylvania district. A Cumberland, Md., tin plate manufacturer has withdrawn an inquiry for 3,000 tons of open-hearth sheet bars, but is expected to revive this soon. Eastern rolling billets remain at $22.40, Philadelphia, or $20, Pittsburgh, and $4 to $5 higher for forging steel.

The market for semi-finished materials in the greater Pittsburgh district continues to peg along at a quiet gait. New sales are so infrequent that it is impossible to find trace of them in the open market. So far as can be learned, however, prevailing billet and sheet bar prices are representative. Reports are heard that wire rods are obtainable at $24.50, but no actual sales can be found.

No Improvement at Ashland

The market is very quiet at Ashland. A few orders have been received during the past week, but they are for very light tonnages for quick delivery. Billets are quoted at $20.50, and wire rods at $26.50, both Ashland basis.

Landers, Frary & Clarke, New Britain, Conn., are pushing work on what is to be the tallest factory building in New Britain. This structure is 65 x 125 feet and is to be eight stories. It is expected to be ready for the installation of machinery by Aug. 1. The company also has purchased additional property in New Britain, recently, so that it now owns the whole block bounded by Commercial, Center, East Main and Elm streets, with the exception of one small lot.

Some Buying of Alloys

A Bridgeport, Conn., buyer has placed 20 tons of Bessemer ferro-silicon. An inquiry for 600 tons of 50 per cent ferro-silicon is pending in the eastern market for a western steel maker. There is no buying of consequence in ferro-manganese in eastern districts. Ferro-manganese prices remain unchanged at $38, seaboard, for both English and German material.

Ferro-Alloy Quiet at Pittsburgh

The market for ferro-alloys in the Pittsburgh district shows no snap. Ferro-manganese is being held at $38, seaboard, but the price has not been tested. Ferro-silicon is unchanged in price.

Tin Plate Order

Tin plate mills continue to show signs of activity, and indications are that present schedules will be maintained for some time. The Standard Oil Co. has increased its order with the American Sheet & Tin Plate Co. to 750,000 boxes for export shipment.

Lake Erie Ore Receipts

Out of a total movement of 3,852,063 tons of ore during May, 2,589,338 tons were received at Lake Erie ports, distributed as follows:

Port.	May, 1913.
Buffalo	325,671
Port Colborne	43,543
Erie	30,230
Conneaut	591,331
Ashtabula	504,495
Fairport	216,632
Cleveland	479,736
Lorain	193,074
Huron	92,346
Sandusky	.....
Toledo	78,096
Detroit	34,184
Total	2,589,338

The Diamond Forging & Mfg. Co., Pittsburgh, through the Pittsburgh Industrial Development Commission, has arranged for a switch extension which will mean the building of an addition to the plant. The company manufactures drop forgings.

The Teller Iron Co., Chicago, has moved its offices to 647-648 First National Bank Bldg.

(*For complete prices see page* 1070.)

Bars Are More Active

And Buyers Show Greater Willingness to Contract—Mills Are Cautious

Considerably more interest is being shown by buyers of steel bars in the Philadelphia district particularly in their forward requirements. The Sheldon Axle Co., Wilkesbarre, Pa., has opened negotiations for 15,000 to 20,000 tons of axle bars for last half. Since this buyer is a maker of wagon axles, its bar requirements are considered in the agricultural machinery class. One leading steel bar maker within the week booked contracts with eastern Pennsylvania consumers, aggregating 5,000 tons, on the basis of 1.30c, Philadelphia, or 1.15c, Pittsburgh, for third quarter, the largest lot of which was 2,000 tons, while in one case 1.35c, Philadelphia, or 1.20c, Pittsburgh, was obtained for fourth quarter. Other inquiries now pending in the Philadelphia market include 2,000 tons for an agricultural implement manufacturer, 2,000 tons for another buyer and 500 tons for an eastern Pennsylvania nut and bolt maker. The bureau of construction and repair of the Navy Department will take bids June 23 on several hundred tons of bars for various navy yards. In the eastern market, steel bar makers seem to be holding firmly for 1.30c, Philadelphia, or 1.15c, Pittsburgh, for forward delivery. An attractive order for immediate rolling possibly could shade this slightly.

Taking Contracts at New York

More disposition to make contracts continues to be shown by consumers of steel bars in the New York district, this including some of the implement trade in that territory. The mills are meeting these overtures with more willingness to sell for third quarter at 1.15c, Pittsburgh, than beyond and for the fourth quarter some of them now are talking $1 advance. As yet, this display of greater interest in metropolitan territory has not resulted in the placing of much tonnage.

Steel Bars More Active at Pittsburgh

Specifications against contracts for steel bars have been coming out in better volume in western Pennsylvania the last 10 days, although leading makers say they do not expect to see permanent improvement until fall. Efforts are being made to hold the market at 1.15c and leading mills are refusing to shade that figure, although lower prices have come out in some cases.

Bar iron in western Pennsylvania is quiet. Mills in adjoining districts are offering material at low figures and the quotation at Pittsburgh is nominal.

In the Cleveland district as low as 1.10c, Pittsburgh can be done on steel bars for prompt delivery. For a short time contract, prices range from 1.12½c to 1.15c Pittsburgh. Mills are very slow to make contracts beyond the third quarter. Some agricultural implement manufacturers have intimated that they would be willing to pay 1.20c on standard contracts.

Steel Bars Still Lag

While a slight improvement in sentiment in Chicago has been apparent in the steel market generally, steel bars have felt this less than other finished products, as agricultural implement makers still remain out of the market and railroad car buying has not affected bars to any great extent. However, prices are somewhat firmer than has been the case and 1.28c to 1.33c, Chicago, appears to be the bottom, with less appearance of weekness than was apparent during May.

Iron Bars Stationary

No particular improvement is apparent in iron bars at Chicago, though specifications continue at a rate that has obtained for several weeks past, being slightly in excess of shipments. Mills, however, are not accumulating much tonnage and are operating practically from hand to mouth. Orders are coming from widely scattered sources and are mostly for small tonnage, while large orders are scarce and mills are avoiding as far as possible making contracts for deferred shipments, at present prices. The market is well represented by the existing quotation, 1.10c to 1.12½c, Chicago.

Eastern Iron Mills Close

Several of the eastern Pennsylvania puddling and bar iron mills have shut down because of poor business conditions. The eastern bar iron market is dull and prices are safe. On carloads and less, 1.20c to 1.22c, Philadelphia, openly is made. On larger lots 1.15c, Philadelphia, has been done.

Hoops, Bands and Cotton Ties

The market for hoops, bands and cotton ties in western Pennsylvania offers nothing of interest. Prices of hoops and bands are being held fairly well, but there has not been enough new buying to test quotations. The cotton tie situation is unchanged. With the exception of one plant, which rolled only a limited tonnage last year, all the cotton tie mills in the north are busy. Federal government reports indicate that the cotton crop this year will be considerably below normal.

Central Foundry Co. Low

On Eighty Thousand Tons of Cast Iron Segments—Pipe Lettings Not Numerous

The Central Foundry Co. has submitted the lowest bid to the general contractors for the furnishing of the 80,000 tons of cast iron segments for the new East river tubes at New York City. This company's bid, it is understood, ranged from $27.70 to $29.75, delivered, for the several types of segments specified. It is not yet assured that the Central Foundry Co. will receive the award, as there is very keen competition for the business and negotiations still are being carried forward by the general contractor. Among the other bidders for the castings are the American Brake Shoe & Foundry Co., the Buffalo Foundry & Machine Co., the Bethlehem Steel Co., the Davies & Thomas Foundry Co., Catasauqua, Pa., and others. Small lettings still make up the eastern cast iron pipe market. The Warren Foundry & Machine Co. has 450 tons of 36-inch for Fall River, Mass., at $19, delivered. The United States Cast Iron Pipe & Foundry Co. has taken 270 tons for Malden, Mass., at $23.50, delivered, for 4's, $22.50 for 6's and $21.40 for 10's and 12's, and also has 140 tons for Jersey City and 130 tons for South Orange, N. J. The Canadian Iron Corporation has taken 660 tons of 4's to 14's for Quebec. An export inquiry for 1,200 tons, largely 4's and 20's for Santa Clara, Cuba, is pending.

Cast Pipe is Steady

The cast iron pipe market in Chicago continues to be made up largely of routine orders for small tonnages, principally by contractors and no considerable municipal contracts are being taken. Bids will be opened this week on a tonnage at Salt Lake City and the Detroit Fire Commission will award 390 tons for high pressure work this week. Some smaller municipal tonnages are pending.

(*For complete prices see page* 1070.)

Sheet Prices Are Low

And Pittsburgh Base is Often Disregarded— Recent Concessions in the East

Despite efforts of sheet manufacturers in western Pennsylvania and eastern Ohio to maintain prices, low quotations continue to come out when attractive tonnages are involved. Freight differentials are being waived in some instances and the Pittsburgh basing price is not regarded at all in many cases. Galvanized sheets have sold at 2.75c for No. 28 gage, and blue annealed sheets, for delivery to Cleveland, have reflected weakness. Specifications have come out in slightly improved volume. The American Sheet & Tin Plate Co. is operating sheet mills at less than 60 per cent capacity.

The recent contract of the Hydraulic Pressed Steel Co., Cleveland, for 8,000 tons of sheets, was on the basis of 1.25c, Pittsburgh, for No. 10. The specifications were, however, unusually attractive and 1.35c, Pittsburgh, is the minimum on ordinary business in the Cleveland district.

East Claims Lower Prices

Buyers of sheets in eastern Pennsylvania have been reporting their ability to shade to 1.30c, Pittsburgh, or 1.45c, Philadelphia, the market on No. 10 gage blue annealed. Leading eastern sheet makers will not meet this figure, and hold for a minimum of 1.35c, Pittsburgh, or 1.50c, Philadelphia. It is to be noted that the eastern mills have obtained the business in three quarters of the cases where lower offers were said to have been made. Buying for close-by needs remains the principal activity in the cast, and little change in volume is being shown from week to week. Mill operations vary, but the Conshohocken maker this week is running full.

No Improvement in Sheets

The sheet market in Chicago apparently has settled to a steady level with small business and somewhat reduced operations.

The usual differential of $1 per 100 pounds between black and galvanized is not being adhered to as closely as usual and while black sheets are quotable at 1.98c, Chicago, galvanized may be obtained at 2.93c, Chicago, which is $1.05 per 100 pounds differential. These prices appear to be so close to cost, or so far below cost, as the case may be, that few makers have the hardihood to shade them materially. Quotations remain 1.98c to 2.03c and 2.98c to 3.03c, Chicago, for black and galvanized, respectively, although tonnages of the latter have been taken at $1 per ton lower.

Better at Cincinnati

The sheet market has shown a decided improvement in the Cincinnati district during the past week. New orders are more numerous and for better tonnages, and specifications on old contracts are heavier. Prices are unchanged, as the improvement has not been of sufficient importance to bring about an advance. Large makers in that territory state that in their opinion quotations have struck rock bottom and that they will reduce their working force before they will sell at lower figures. Black sheets No. 28 are quoted at from 1.90c to 2c, galvanized No. 28 at from 2.85c to 2.95c and blue annealed No. 10 at 1.55c, all Cincinnati basis.

Contracts for Coke

Being Made by Cleveland Foundries—Connellsville Production Decreased

Cleveland foundries are making contracts for coke at $2.50 to $2.65 in some cases for six months and in other cases for the full year. It seems probable that $2.50 will be the minimum quotation in the Cleveland market for high-grade foundry coke.

Connellsville Output Lower

Approximately 5,000 ovens were blown out in May, and it is estimated that the upper and lower Connellsville regions are operating at not more than 50 per cent capacity. The market continues void of excitement. Foundry coke is being freely offered at $2.50, ovens, for 12-months delivery, although some operators are asking $2.65. Spot foundry is obtainable at $2.35, ovens. The furnace market is unchanged; spot furnace coke is going at $1.75, and contract coke is commanding from $1.85 to $2, ovens. *The Connellsville Courier*, for the week ending May 30, says production was 244,028 tons, a decrease of 13,602 tons compared with the week before.

There is an inquiry in the St. Louis market for 1,500 tons of foundry and furnace coke, and another for 1,800 tons foundry coke. Connellsville 72-hour foundry coke is quoted at $2.50 to $2.75, and 48-hour furnace grades at $1.85 to $2, ovens, on contract.

At Cincinnati the coke market has drifted through the past week without any change in prices following the reductions that occurred last week. The majority of sales at the present time are for small lots of foundry coke for delivery during the third and fourth quarters, principally the latter. Furnaces are not buying in large amounts and are only contracting for a month at a time because of lower prices obtainable for spot shipment fuel.

Considerable buying of foundry coke continues in eastern districts for 6 to 12 months from July 1 at $2.50 to $2.75, Connellsville. The American Locomotive Co. is inquiring on 3,500 to 4,500 tons of foundry coke for the last half for its Schenectady and Dunkirk plants. In the Philadelphia district, one seller reports sales of more than 3,000 tons since June 1.

Wire Nails

Sold Freely at $1.50—Jobbers' Specifications Improve

At Cleveland the leading interest reports improvement in specifications from jobbers and more favorable conditions generally, although there is still much cutting of prices and $1.50 is the ordinary quotation on wire nails. Prices on plain wire are very irregular.

Wire Nails $1.50, Pittsburgh

Practically all manufacturers in western Pennsylvania are offering wire nails at $1.50 a keg for prompt shipment; $1.55 is being asked for future delivery. Specifications have been coming out in better volume in the west, but there is no noticeable change in the situation at Pittsburgh. Mills probably will experience a decidedly dull summer.

Wire Business is Normal

Improvement in the wire market at Chicago has been made during the past few weeks until conditions now are practically normal for this season. Orders are coming in at sufficient volume to make it worth while and quotations are being held by the leading interest at 1.50c to 1.55c, Pittsburgh, for nails and 1.30c to 1.38c, Pittsburgh, for plain wire.

(*For complete prices see page* 1070.)

Scrap Still in Dumps

With Very Little Tonnage Moving—Lifeless Market at Pittsburgh

Scrap prices in the Chicago market remain pegged practically at the level which has existed for the past month. So little movement is apparent that it is difficult to fix quotations, which are practically nominal, with only slight variations from week to week. More than 8,000 tons are before the market now on railroad lists as follows: Wabash, 1,000 tons; Louisville & Nashville, 400 tons; Northern Pacific, 800 tons; Southern Railway, 3,000 tons; Mobile & Ohio, 800 tons; Soo Line, 1,500 tons and C., M. & St. P., 800 tons.

The railroad lists for scrap iron in the St. Louis market are: Wabash, 2,000 tons, closing Tuesday; Mobile & Ohio, 1,000 tons, closing Tuesday; Southern, 4,000 tons, closing Thursday; Texas Pacific & Iron Mountain, 3,000 tons, closing this week. The throwing of this large amount of scrap on the market has tended to weaken prices, but dealers are not willing to make any changes at present. Scrap is dull, and buying confined almost to the steel mills.

At Cincinnati the iron and steel scrap market has held during the past week with the exception of stove plate, which has been reduced 25 cents a ton, being now quoted at from $6.75 to $7.25 per net ton. Conditions are very unfavorable. Demand is at a minimum and a few sales that are being made are for extremely small lots. The surplus of scrap in dealers' yards and throughout the rural districts is increasing and it is now far in excess of consumption.

Dull at Cleveland

At Cleveland demand continues extremely lax in the iron and steel scrap market. What few transactions there are transpire principally among dealers. Supplies are accumulating; yard stocks are said to be exceedingly large. About 4,000 tons of miscellaneous yard scrap have been brought into the city within the past week or so. Slightly more than 600 tons of structural bridge scrap were recovered from the recently burned portion of the Central viaduct; from burned box cars to the number of 51, belonging to the Ringling Bros. circus, about 200 tons or more scrap was recovered.

The melting steel market is quotable about $10.25 to $10.50. One consumer offers about $10.50 to $10.75 for the highest grade of shop steel. Another offers $10.25 for ordinary grades. Machine shop turnings may be quoted about $5.25 to $5.75; malleable railroad iron about $10.50 to $11.

Scrap Dead at Pittsburgh

The market for old materials at Pittsburgh is decidedly dead. None of the more important consumers is figuring in the market, and quotations for nearly all grades are nominal. In the valleys and in adjoining districts, consumers of heavy melting steel are refusing to pay more than $11.75, and considerable material has sold at that figure. An embargo has been ordered against the LaBelle Iron Works, Steubenville, O.

Better Tone at Buffalo

The scrap yards report an improvement in sentiment at Buffalo and dealers seem to feel that prices will go up rather than down. There is no change in schedules noted, however. While the selling interests are looking for an improved demand, the users are not coming into the market to any extent for material at the prices being insisted upon by the yards. The booking of the week while more general in character has been in small tonnages for immediate needs or to save demurrage.

Few Orders at Philadelphia

New orders being taken by brokers or dealers in old material in the eastern Pennsylvania market are few, but the Alan Wood Iron & Steel Co. in the week bought 2,000 to 3,000 tons additional of heavy melting steel at $10.50 to $10.75, delivered. There has been also some trading in steel between brokers at the lower figure. Other grades are being purchased only in light quantities. The Pennsylvania railroad has disposed of its large list aggregating about 23,000 tons of various grades, and it is understood about the present market was realized.

Slow Conditions at New York

Sellers at New York still find it difficult to interest consumers in old material. The best that can be done is small lots. The holders of material are no more anxious to sell at prevailing prices than consumers are willing to buy and the market remains very narrow. The railroad lists are the principal offerings. One eastern Pennsylvania steel works is offering $10, delivered, for heavy steel, but is not believed to be actually in the market, as recent sales at $10.50 and $10.75, delivered, are noted. Market gossip has it that one dealer has sold 4,000 tons of steel at $10.75, delivered eastern Pennsylvania, but as shipments on other orders to the point mentioned are being held back, the report is not credited.

(*For complete prices see page* 1070.)

Plate Orders

More Numerous in East—Specifications Improve

Some eastern Pennsylvania plate makers booked the past week considerably larger volume of orders which was made up of widely mixed lots, most of them small. Some eastern buyers of plates, including one of the largest consumers in that territory, are beginning to talk of contracts for third quarter and beyond. Makers hold back from selling far ahead at ruling prices. One of the shipyards about Philadelphia is inquiring for several thousand tons of plates for new work. Ship steel of late has been exceedingly small. The eastern plate market remains at 1.25c to 1.30c, Philadelphia, or 1.10c to 1.15c, Pittsburgh, depending on the particular order.

Car Orders Help New York

The release the past week of the large car order by the New York Central lines, involving a heavy requirement of steel, has been received favorably in the plate market in New York territory. These cars are to be built at Berwick, Pa., St. Louis and Butler, Pa., and the steel will go largely to Pittsburgh and Chicago mills. Large users of plates who buy at New York are not doing much negotiating for last half, as yet, but are expected to take up these matters, soon. There continues the usual odd lot trade in the metropolitan district, which is going chiefly to eastern mills at 1.26c to 1.31c, delivered, or 1.10c to 1.15c, Pittsburgh.

Some plate manufacturers in western Pennsylvania say specifications the first week in June were from 40 to 50 per cent heavier than those taken in the corresponding period in May, but mill operations have not been increased. Active car buying last week will materially assist mill managers in arranging schedules for a few weeks. Material still is going at 1.10c.

Plates Feel Uplift

The steel plate market in Chicago has felt something of an upward movement since the renewed car buying of the past few days, as some of the material for this probably will be placed with western mills. The improvement, however, has been purely sentimental. Mills are still hungry for tonnage, and quotations are no higher, resting on the apparent bedrock level of 1.28c to 1.33c, Chicago.

Larger Tonnage of Steel

Involved in Structural Contracts Pending—Improvement in New England

Improvement in the volume of figuring on structural steel requirements is shown in New York and surrounding districts. New England especially is offering work more actively and is putting out a good tonnage. The work coming out covers all classes of construction, but railroad offerings remain very moderate. Loft building enterprises at New York City, which have been backward, are showing some revival. Structural steel awards of the past week at New York and vicinity total 8,000 tons, and new work inquired for reaches about 8,000 tons. No subway or elevated railroad steel is involved in the week's figures. The date for the closing of bids for the 15,000 tons Chesapeake & Ohio railroad bridge at Portsmouth, O., has been extended. Plain material prices show no change and range from 1.26c to 1.31c, New York, and 1.10c to 1.15c, Pittsburgh.

Offerings Light at Philadelphia

New structural requirements at Philadelphia and vicinity make an unsatisfactory showing for the mills and fabricating shops. The partial scale of plate operations is being maintained by the present run of business, but it is difficult to increase this rate and the limited volume of work makes competition very keen. Prices quoted on bridge work in the Philadelphia district recently have been extremely close. Lettings include about 3,000 tons of new construction for the eastern Pennsylvania coal fields. Shape prices hold to 1.25c to 1.30c, Philadelphia, or 1.10c to 1.15c, Pittsburgh.

The market for structural shapes in western Pennsylvania continues to peg along at a quiet gait. Specifications have come out in better volume, compared with a few weeks ago, but no snap is reflected. Mills are endeavoring to hold the market at 1.15c, but that figure continues to be shaded in some cases.

The fabricators of the Buffalo district report an increased amount of work being figured, some offices being crowded with estimating on proposed developments. Prices, however, remain low.

On the contract for building the repair shops of the Cleveland Railway Co., Walter I. Thompson & Son and Roderick J. Grant were the bidders when bids were called for the second time. It is understood that on the general contract amounting to about $585,000, Walter I. Thompson & Son was about $5,000 lower than Mr. Grant. The former were awarded the contract. About 1,600 tons of steel will be required. On the contract for the Dime Savings Bank, Toledo, calling for 1,200 tons of steel, there was very active competition, and it is understood that the contractor for the iron and steel will obtain the plain material at 1.12½c, Pittsburgh. It is not expected that the 24,000 tons for which the Brown Hoisting Machinery Co. recently sent out an inquiry will be placed. It is regarded as a "feeler".

Structural lettings the past week in the Chicago district aggregate 2,500 tons and are widely separated, no single job totaling 1,000 tons.

CONTRACTS AWARDED.

The Dime Savings Bank, Toledo, 1,200 tons, awarded to the Donovan Iron & Wire Works, by A. Bentley & Sons, general contractors.

The Cleveland Railway Co. shops, 1,600 tons, awarded to Walter I. Thompson & Son.

Repairs to Central Viaduct, Cleveland, 600 tons, awarded to the King Bridge Co.

Lackawanna Bridge Co., Buffalo, contract, 500 tons steel, for Sandusky River Power Co.'s pipe line work, Fremont, O.

T. I. Bird Co., New York City, contract, 1,000 tons steel, Onondaga Hotel addition, Syracuse, N. Y.

Bridge over Lehigh river at Bethlehem, Pa., 1,500 tons, awarded McClintic-Marshall Co.

Mountainside Hospital, Glen Ridge, N. J., 300 tons, awarded to the Hedden Iron Construction Co.

Power house and garage for the New York & Queens Electric Light & Power Co., Jamaica, L. I., 350 tons, awarded Hedden Iron Construction Co.

Martha Cook building, University of Michigan, Ann Arbor, 450 tons, awarded the American Bridge Co.

Loft building for the Antler Realty Co., West Thirty-eighth street, New York, 700 tons, awarded to the Passaic Structural Steel Co.

Plant for the National Carbon Co., Long Island City, 650 tons, awarded to Levering & Gerrigues.

Addition to the plant of the J. S. Mundy Co., Newark, N. J., 300 tons, awarded to the McClintic-Marshall Co.

Minsi Trail Bridge, South Bethlehem, Pa., 1,500 tons, awarded the McClintic-Marshall Co. The Bethlehem Steel Co. will furnish the steel.

Elks Clubhouse, Baltimore, 450 tons, awarded the Chesapeake Iron Works.

Agricultural office building, Washington, awarded the Standard Concrete Steel Co. for reinforced concrete construction and steel column cars, 200 tons, only will be used.

Highway bridge at Eighty-fourth street, Philadelphia, 200 tons, awarded the Belmont Iron Works.

Coal Breakers at Truesdale, Pa., and Woodward, Pa., and headframes for Delaware, Lackawanna & Western Coal Co., 2,800 tons, awarded to Guerber Engineering Co. These breakers are in addition to the one at Loomis, Pa., recently awarded the same fabricator.

Store and office building for Texas Co., Houston, Tex., 1,200 tons, awarded to the Moser Mfg. Co. This contract was reported as having gone to another shop.

Bridge at Mechanicsville, N. Y., for Boston & Maine railroad, 2,500 tons, awarded Pennsylvania Steel Co.

Power station at Preston, Idaho, 300 tons, awarded A. E. Norton & Co.

Addition to the Harvard Club, West Forty-fourth street, New York City, 500 tons, awarded Eidlitz & Ross.

Chicago & Western Indiana R. R. Co., viaducts at Crawford and Cicero avenues, Chicago, 805 tons, to the Lackawanna Bridge Co.

Thompson Falls Power Co., Thompson, Falls, Mont., 452 tons, to the American Bridge Co.

Colorado River Bridge, Smithville, Texas, 442 tons.

Missouri State Life Building, St. Louis, Mo., 440 tons, to American Bridge Co.

Lorimer Bridge, Piqua, O., 277 tons, reinforcing bars, to Hakerdon Construction Co., Indianapolis, Ind.

STEEL CONTRACTS PENDING.

Municipal building, Wilmington, Del., 1,500 to 2,000 tons. Bids being taken.

Addition to plant of Pennsylvania Sugar Refining Co., Philadelphia, 1,000 tons. Bids asked.

Armory at Allston, Mass., 700 tons. Bids being taken.

Loft building at Madison avenue and Twenty-eighth street, New York City, for the Robert Goelet estate, 2,100 tons. Bids being taken.

Addition to Anderson building at Fifth avenue and Thirty-eighth street, New York City, for the Bonwit, Teller & Co. store, 2,100 tons. Bids being taken.

Garage on East Seventieth street, New York City, for the Automobile Club of America, 700 tons. Bids being taken.

Mill and power house for the Phelps Insulated Wire Co., Pawtucket, R. I., 700 tons. Bids asked.

Viaduct at Bethlehem, N. Y., for New York state, 430 tons. Bids being taken.

Terminal subway building, Newark, N. J., 5,000 tons or more, bids about to be taken by the public service commission.

Large Pipe Order

Taken by Youngstown Company—Demand Improves

Demand for wrought steel pipe, but more especially for line pipe, is picking up and some good tonnages are being placed. The Youngstown Sheet & Tube Co. has just taken an order for between 15,000 and 20,000 tons of line pipe. The order placed for the Royal Dutch Schell Co. is for 175 miles of 8-inch and 10-inch line pipe, and is to be taken by the Valley Pipe Line Co. for use in the California oil fields. This is one of the biggest line pipe orders placed in many a day.

An independent mill in the Pittsburgh district has taken 25 miles of 16-inch line pipe for shipment to West Virginia and another order for 15 miles of 16-inch pipe has been placed for Ohio shipment. Manufacturers say discounts on merchant pipe are being well maintained.

(For complete prices see page 1070.)

German Market Still Depressed

Talk of Improvement, But Orders Do Not Come In—Russian Market Alone Strong

Berlin, May 27.—In Germany the situation of the iron trade is again very undecided. There is a good deal of talk of an improvement in the market, but it is not borne out whenever the test of booked orders is applied. The pig iron syndicate held a meeting recently, at which it was decided to leave prices unchanged for the third quarter with the proviso that members shall have the option of meeting any attempted dumping on the part of English makers by competitive concession. It was stated at the meeting that the shipments from furnaces during May were on approximately the same scale as in April.

The German Wire Rod Syndicate, which controls a yearly production of over 1,100,000 tons, is in an uncertain position at the present time. A few years back, the members of the syndicate arranged for the shutting down of various mills, the owners of these being compensated on a basis of the average output of their particular mills within certain periods. A year ago, a definite prolongation of the Rod Syndicate for five years could not be secured owing to the large increases demanded in allotments by some makers. Matters were, however, fixed up provisionally for one year to expire June 30 next. The latest news comes to the effect that the Wire Rod Syndicate has been provisionally prolonged once more, this time until Oct. 31. This will allow of further negotiation for the definite prolongation of the syndicate. If no agreement is reached by Oct 1, however, the members of the syndicate will be free to undertake sales on their own individual account.

Negotiations are also proceeding for a syndication of the steel bar branch of the trade. With regard to tubes, negotiations in that department have been postponed because one firm held out. So far there has been no special move made towards a syndication of castings and forgings. Makers in these branches are apparently waiting on developments in the other sections.

French Iron Trade

Paris, May 27.—The French iron industry, like that of so many other countries just now, has for some time become gradually a little less prosperous. Exception should be made as regards those works which devote themselves chiefly to the manufacture of war material and the automobile trade, agricultural implements and electrical machinery. The Paris-Lyons-Mediterranean railway is now in the market for 2,200 freight cars, 50 baggage, 127 passenger coaches and 60 locomotives, with a like number of tenders, and as the orders will in all probability be spread among the various engineering plants, they will afford considerable relief to industry.

Russian Iron Trade

St. Petersburg, May 26.—Reports from Kharkoff, the chief center of the Russian iron business, say that on all the Russian markets both cast and pig iron are strong and there is no prospect of a weakening in the near future; but in the Urals, where the government smelting works have been offering pig at less than the private works, there is an artificial weakening; but it is looked upon as a very temporary event, for the reserves of pig iron in the government factories are already exhausted. On the other hand, on the Kharkoff market, in consequence of the insistent demand, prices have risen by 2 copecks (1 cent) per pood (36 pounds). The shortage of pig iron is felt particularly in the central industrial district. Touching section and roofing iron there is a great shortage for the reserves are exhausted in the Urals.

The markets in Moscow and at Saratoff, Samara, have become, if anything, stronger since the state of the roads for transporting goods has improved, besides of course the opening of the building season. The current sorts of section iron have become scarce and roofing iron particularly so. Comparing the prices of iron on the Kharkoff market now and at the corresponding period of 1913, we find section iron 1 rouble 53 copecks-1 rouble 58 copecks (77½-80 cents) against 1 rouble 44 copecks-1 rouble 53 copecks (73-77½ cents); girder iron, 1 rouble 53 copecks-1 rouble 63 copecks (77½-82½ cents) against 1 rouble 46-54 copecks (74-78 cents); tank iron, 1 rouble 70-78 copecks (86-90 cents) against 1 rouble 60-65 copecks (81-83½ cents); roofing iron, 2 roubles 20-25 copecks (112-114½ cents) against 2 roubles 10-20 copecks (107-112 cents); pig iron, 72-74 copecks (36-37 cents) against 70-72 copecks (35-36 cents).

Belgian Iron Trade

Brussels, May 27.—Although it seemed a week or so ago as if the clouds hanging over the premier industry of Belgium were beginning to lift a little, when the manufacturers of some of the leading products felt themselves sufficiently strengthened to advance prices 24½ cents or more per ton for export, it now appears that this step was premature. For while buyers of bars were ready to take some risk in the placing of considerable orders at $19.47 to $19.71, f. o. b. Antwerp, they entirely withdrew when makers advanced their limits from $20.20 to $20.44. The position of independence was as quickly abandoned as it had been assumed, and now prices are at their old depressed level. Meanwhile, the situation is certainly not an enviable one, and the more favorable reports received recently from Germany and also from the United States, are not as good as they then looked. Short time on a very extensive scale is being practiced, some putting it at as high a figure as 40 per cent of the full capacity. The depression has taken hold of the pig iron market as well, and the recent reduction in quotations has been followed by further concessions, which put foundry iron to $16.30 to $16.55, f. o. b. It is also stated that the output is to be curtailed, and for a beginning the blowing out of three to four furnaces is intended.

Making Small Steel Castings

C. S. Koch, president of the Fort Pitt Steel Casting Co., McKeesport, Pa., addressed a well-attended meeting of the Philadelphia Foundrymen's Association at the Hotel Walton, Wednesday evening, June 3, upon the subject of "The Manufacture of Small Steel Castings as a Specialty." In his address, Mr. Koch described various furnace methods for small steel castings production and the relative values of each, reviewed cleaning and annealing methods and covered the features wherein the operations of this type of foundry differed from other plants. A liberal discussion of the paper followed its presentation. The meeting of the Philadelphia Foundrymen's Association was the last scheduled before the summer recess. The meetings will be resumed in September.

English Pig Iron Slightly Firmer

Collapse of Gas Strip Association Most Interesting Event in Finished Lines—Prices Irregular

Office of The Iron Trade Review,
Prince's Chambers, Corporation St.,
Birmingham, Eng., May 30.

The market for pig iron is slightly firmer than it was, and although prices have not improved, it is generally agreed that the position of makers is rather better. The most noteworthy feature is the steady and constant reduction in the Cleveland stocks which now stand at 83,000 tons, with prices firm at 51s 3d ($12.54) for ordinary warrants. The shipments so far this month total about 60,000 tons. There has been more contracting, although not for long periods. Makers' stocks everywhere are very small, and it is many years since the public stores held such a small quantity of iron. It is notorious that selling prices are very near to the cost line, so that while buyers are not speculative, sellers are still less inclined to accept heavy contracts. The pressure for delivery has increased, owing to the delay, until the last moment of the placing of orders. At the Birmingham meeting on Thursday, slightly more business for small lots was reported. In the hematite branch at Barrow-in-Furness the tone is rather more hopeful; but consumers are trying their hardest to "bear" the market. Makers, on the other hand, owing to better bookings, are in a stronger defensive position, and are not at all inclined to give way. The Northeastern hematite market has lost some strength owing to the cheapening of steel. It is possible to buy mixed numbers at 61s ($14.92) for early or forward delivery. In the Scotch districts, pig iron is suffering from the severe depression of the steel trade. It is stated that the position has never been quite so bad in that district. There are now 71 pig iron furnaces blowing in Scotland, a reduction of one on the week. The blown-out furnace, situated at Coltness, was engaged in the production of hematite. In Scotland, as in England, pig iron makers are rigidly restricting production to bare requirements and are setting their faces against all stocks. For best foundry irons the demand is fully equal to the supply, and prices are well maintained. Smelters are getting a little relief through the continued easing of coke prices.

Finished Iron and Steel

In the finished department some peculiar irregularities exist. In the Black Country, the iron trade is showing improvement and a number of works are once more running full time—not on large orders, but on a fair aggregate of small orders. The warehouse owners have come forward with substantial stock orders, and they are sufficiently confident as to prospects to endeavor to double the quantities originally placed. But no advance in prices has taken place, and at present it is useless to attempt to force them upwards, but fairly large quantities of best iron are being taken, largely for wagon building and engineering, and the total seems likely to increase.

The most interesting development of the week has been the breakdown of the Gas Strip Association. This has existed for about 14 years; but for some time past the outside competition has been very severe, and a fortnight ago members were given permission to put down their quotations, according to circumstances. After this, the continued existence of the association became more or less of a farce, and at a meeting held yesterday the final quietus was decided upon. The immediate effect has been to pull down prices about 5s ($1.22) per ton, so that strip can now be bought at £6 5s 0d ($30.60). This is described as a low and unprofitable price, yet it is not sufficient to successfully cope with Belgian material, which is still coming in. The tube trade is taking fairly large quantities of gas strip. The heavy tube trade to some extent has benefited by the very large use of strong tubes for tramway poles, of which thousands have been brought into use in recent years.

Price Irregularities

The position in the steel trade is very unsatisfactory, largely on account of the irregularity of prices. Scotland continues to lead the debacle. It is said that depression in Scotland has never been so severe. Apparently the Belgian makers have monopolized the ship-plate business. All the Scotch steel works are on short time, and specifications for ship and boiler plates are extremely scarce, both for home delivery and export. Fairly large quantities of American bars, hoops and strip are reported to be finding their way to the port of Glasgow, at prices much below the lowest possible Scotch quotation.

At Barrow, the steel trade is better, with orders rather more plentiful for railway and shipbuilding material; but even there the works are not fully employed. Prospects, however, are excellent, several orders for new ships including iron clads for the Turkish government having been placed there.

For Members

Pittsburgh Foundrymen Will Conduct Campaign

The Pittsburgh Foundrymen's Association expects to reduce a substantial surplus carried in the treasury by arranging an elaborate program and by carrying out an extensive membership campaign for the 1914-15 season. Plans for the ensuing year were outlined Monday night at the Fort Pitt hotel, Pittsburgh, at the last meeting of the season. Reports of officers indicated that the association has a net balance of $980.64, aside from a trust fund of $3,294.12. Some of the prominent authorities on foundry practice in the country will appear before the meetings next season if proposed plans materialize. The membership roll now includes 130 names.

Officers for the year were elected as follows: President, H. J. Koch, Fort Pitt Steel Casting Co.; vice president, George B. Koch, Pennsylvania railroad, Altoona; treasurer, W. J. Brant, W. J. Brant Co.; secretary, F. H. Zimmers, Union Foundry & Machine Co. The executive committee follows: H. W. Petty, American Steel Foundries; J. Uhler, Union Steel Casting Co.; C. H. Gale, Pressed Steel Car Co.; Bayard Phillips, Phillips-McClaren Co.; W. R. McCord, *Industrial World*.

Newark Foundrymen's Association

The Newark Foundrymen's Association, Newark, N. J., held its last meeting of the year on Wednesday evening, June 3. H. P. McDonald, of the Snead & Co. Iron Works, Jersey City, who last month was elected president, made his first appearance as the presiding officer. The new secretary, J. S. Kinne, of the Riverside Steel Casting Co., Newark, was also on hand to begin his work.

The speaker of the evening was Wm. S. S. Coleman, of Newark, insurance broker, who talked on employers' liability and outlined a plan for forming a mutual company among the foundries

and machine shops of New Jersey. G. Hannay, Louis Sacks and James Flockhart, who were appointed as a committee at the last meeting, presented a resolution formally expressing the association's gratitude to Arthur E. Barlow, the retiring secretary, for the faithful and untiring service he rendered during the many years he occupied the office. A great deal of the prosperity and growth of the association, the resolution said, has been due directly to the efforts of Mr. Barlow. This resolution was adopted unanimously.

Two new members were elected. They were the McNab & Harlin Mfg. Co., Paterson, N. J., and J. M. Ellis, of the Bethlehem Steel Co., New York.

The meetings now stand adjourned until the first Wednesday in October.

Corporation's Loss of Unfilled Tonnage

New York, June 10. (By wire.)—The United States Steel Corporation lost 278,908 tons of unfilled orders in May, according to the statement today. This is about what was expected, and compares with a loss of 376,757 tons in April. Orders on hand at the end of May were 3,998,160, the lowest since the end of September, 1911.

Mr. Swank's Illness

James M. Swank, formerly general manager of the American Iron and Steel Association and the venerable historian of the iron and steel industry, has been seriously ill the past week at his home in Philadelphia, but the latest reports of his condition are favorable. Mr. Swank suffered an attack of kidney trouble and for a few days, grave fears for his recovery were entertained. Happily, a change for the better then appeared. Mr. Swank will be 83 years old on July 12.

Awarded to American Bridge Co.

New York, June 10. (By wire.)—The American Bridge Co. takes 4,000 tons for a section of the Seventh avenue subway, this city, for which the general contract was awarded to the Rapid Transit Subway Construction Co. The American company also has 1,000 tons for Illinois Central track elevation work, Chicago, for which 2,000 tons are yet to be placed.

Field for Engineers

In Public Service Described by Editor Baker—Banquet of Cleveland Society

Members of the Cleveland Engineering Society to the number of 266 attended the thirty-fourth annual meeting and banquet at the University Club, Cleveland, Tuesday, June 9. The guest of honor and principal speaker of the evening was Charles Whiting Baker, editor-in-chief of *Engineering News*, New York. Mr. Baker's topic was "Ethics for Engineers". He said that the people of this country and particularly the residents of cities are getting very tired of muck-raking and also of muck and are looking more and more to the engineer to improve the efficiency of government. He said that whether we

CHAS. WHITING BAKER

like it or not, there is certain to be more supervision and regulation of public utilities and of large business organizations. If, he said, such regulation is to succeed, the engineer must be depended upon to a very large extent. In the field of regulation and supervision, the engineer will find a large and most important field of activity. He will stand between the stand-patter on the one hand and the reckless radical on the other, and take a sane middle view. He will be a powerful factor in constructive reform. Mr. Baker spoke of the recent efforts of several of the large engineering societies to adopt a code of ethics and explained the advantages of having such a code, especially for the younger engineers.

Other speakers of the evening were William O. Henderer, of the Osborn Engineering Co., the toastmaster and retiring president, Rev. Dr. A. B. Meldrum, who spoke on "Some Things That Count", and Elliot H. Whitlock, the president-elect, whose topic was "The Engineer".

The prize of $25 for presenting the best paper of the year was awarded to Reginald A. Wright for his paper on "The Production of Efficient Machine Drawings".

The Society has had an extremely successful year and now has a membership of 741, a net gain of 171 since the last annual meeting.

Heavier Buying

Of Finished Products Causes Hopeful Feeling

New York, June 10. (By wire.)—Heavier buying of finished products is reported in practically all districts and in most lines. This change is leading to expressions of high authorities that June will mark the beginning of the long looked-for buying movement and genuine improvement.

The United States Steel Corporation's new orders reflect general betterment. They are now running about 5,000 tons daily ahead of May.

Buyers are coming forward freely with desires to contract, but makers going slowly in selling far ahead at ruling prices. Quotations generally appear firmer. A number of leading implement makers are now figuring on bars, and it is estimated fully 300,000 tons of actual buying of such business is in sight.

Tubes, wire, sheets and structural are all in heavier demand.

Late Rail Orders

New York, June 10. (By wire.)—The Pennsylvania rail order is still suspended, but may come any day. The Monon gives the Illinois Steel Co. 3,000 tons and the Frisco places 9,000 tons with the Tennessee company. The Canadian Northern is expected to be a large buyer of equipment and rails as the result of the Canadian parliament guaranteeing the $45,000,000 loan.

Offices of the American Sheet & Tin Plate Co. and the National Tube Co. moved recently from the McCormick building, Chicago, to the new Continental & Commercial National Bank building.

Tap Lines Ask for Living Rate

Appeal to Interstate Commerce Commission—May be Necessary to Again Travel Road of Long Litigation

Washington, June 9.—With the Supreme Court of the United States holding that they are entitled to participate in joint rates with trunk lines, representatives of 12 tap lines of the southern lumber industry appeared before the Interstate Commerce Commission last Saturday and sought restoration of the divisions originally enjoyed by them. These divisions ranged from 2 cents to 7 cents per 100 pounds, being greatly in excess of the divisions which steel plant lines have obtained, the latter's share having been 15 cents per ton on outbound and 10 cents on inbound material. In view of the common principles involved as regards the tap and steel lines, the arguments of Saturday were of direct interest to the steel trade. It is probable that through progressive steps the steel lines will sooner or later find themselves facing the precise status now faced by the tap lines.

The original divisions enjoyed by the tap lines were cut down in all instances by the commission through an order, and in some instances entirely eliminated on the ground that the lines were mere plant facilities.

It was outlined to the commission by the attorneys that the tap lines were unable to do business profitably on the basis prescribed by the commission in its old order; that they are entitled to larger divisions than were allowed; that conditions have materially changed since the commission's order was issued and that the commission should allow larger divisions, especially in view of the decision of the Supreme Court. It was plainly stated to the commission that, unless it grants some relief, certain tap lines will have to go out of existence to the detriment of the country they serve.

Those who observed the proceedings were of the opinion that the attitude of the commission was not unfriendly. Chairman Harlan, who prepared both the tap line and industrial railways cases, presided at the arguments and all members indicated a deep interest, Commissioner Clements, the senior member, showing a very lively interest and frequently making comments and inquiries as the arguments proceeded. At one point, he remarked that the case might drag along forever unless the commission could get the ideas of the tap lines about what would be proper divisions for them and could fix the divisions satisfactorily.

It is naturally assumed that the commission is not altogether pleased with the Supreme Court decision and it is perhaps not unfair to say that Mr. Harlan is more dissatisfied than other members. Reports, although of no specially substantial character, were circulated that the commission will remain firm in the tap line case and refuse to order establishment of the desired joint rates. In the absence of such an order, the trunk lines would be naturally expected not to take the initiative. Failing to bring about an agreement to this end with the trunk lines, it is assumed that the tap lines could obtain results by filing of complaints with the commission to compel such an arrangement, or, some claim, the tap lines could again make an appeal through a charge of confiscation of property. Some of the tap lines denoted their preference for the commission to establish the divisions rather than the trunk lines, feeling that less would be obtained by the carriers than by the commission's order.

Judge H. M. Garwood, representing the Tremont & Gulf and the Salem, Winona & Southern, laid down the general principles as he saw them upon which he thought the commission was compelled to act. He took the position that the commission must retrace its steps and allow tap lines to make their bargains with the trunk lines and that even if the question of divisions must be answered by the commission, it must allow divisions large enough to enable roads to live and perform their duties as common carrier. He refused to accept the theory that distance is or could be the controlling factor in fixing divisions. Judge Garwood frankly said he believed that if the commission does not retrace its steps, "the whole weary road of litigation that has been going on for four years will have to be traveled again." This statement was made on the claim that the little roads have been given the right to live and that they propose to do that very thing.

Washington, June 9.—After conferring with counsel for the railroads and shippers, the Interstate Commerce Commission has announced that the general investigation involving ore rates from lower lake ports to Ohio, West Virginia and western Pennsylvania, which was to have begun tomorrow, had been postponed until next fall.

Not Entitled

To Charge for Switching on Private Tracks

Washington, June 9.—Decision of the famous Los Angeles switching case was made today by the supreme court of the United States, which, affirming the opinion of the Interstate Commerce Commission, held that railroads are not entitled to charge for switching on private sidetracks. It was proposed by the carriers to make a charge of $2.50 per car for switching on industrial sidetracks in Los Angeles, Cal.

The former commerce court reversed the commission, and appeal to the supreme court was taken. The sum and substance of the position of the supreme court was that, should the railroads be allowed to assess charges for switching cars on private tracks it would discriminate against owners of such tracks in favor of shippers whose deliveries are made on team tracks, owned by the railroads.

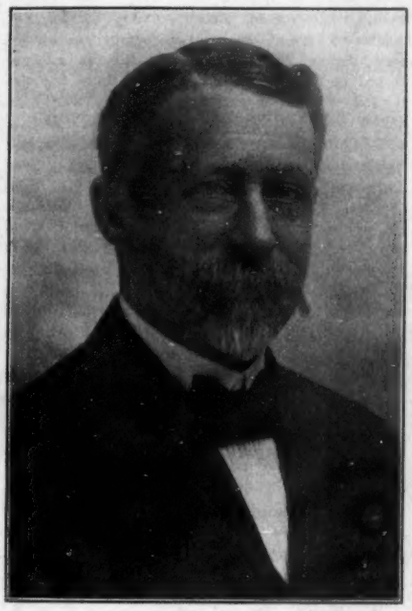
With this decision handed down, it would appear that the theory of Attorney Louis D. Brandeis, special counsel for the commission in the 5 per cent case, that railroads should make a charge for spotting cars, has been punctured. The plan, according to all evidences, met the approval of Chairman Harlan of the commission. Spotting tariffs, proposing a charge of 5½ cents per ton, with a minimum of $2 per car, are now under suspension, and it is believed the commission will allow them to become operative after July 1. The switching services proposed by the roads in the Los Angeles case are identical with the so-called spotting service for which it is now planned to make a charge. Should the spotting tariffs become effective, it is maintained, the commission will have reversed itself and acted contrary to the principles enunciated today by the supreme court.

A modern foundry is being built by the Cyclops Foundry Co., Monongahela, Pa., to replace the one destroyed by fire on Jan. 2, 1914. The new plant is electrically equipped throughout and is expected to be ready for operation by July 1. The offices of the company are in Pittsburgh.

MEN OF THE IRON TRADE

Who they are Where they are What they are doing

George W. Hamilton, assistant superintendent of the Illinois Steel Co., at Milwaukee, was recently elected a member of the American Iron and Steel Institute. Mr. Hamilton began work as a water boy in the rail mill department of the Cambria Iron Co., in February, 1862, and remained with that company until 1895. He spent two years in the drawing room and served three years as an apprentice in the machine shop, working as journeyman with the late Capt. Wm. R. Jones, who was master mechanic at that time. He took charge of the gang erecting the Bessemer plant, and when the steel plant was ready, went



GEORGE W. HAMILTON,
New Member of the American Iron and Steel Institute

to work for Capt. R. W. Hunt on the vessels. Mr. Hamilton went from there to the rolling mills and worked at the rolls in all positions. In 1874, he took charge of the 18-inch rail mill and later the 12-inch mill in connection with it. In 1882, he was transferred to the roll shop, of which he had charge until 1885, when he was again transferred to the rolling mills as assistant superintendent. He left the Cambria company in 1895 to take the superintendency of the Minnesota Steel Co.'s plant at Minneapolis, but in a short time the plant was dismantled and he removed to Moline, Ill. From Minneapolis, Mr. Hamilton went with D. D. Lewis and helped to erect the Algoma Steel plant in Sault Ste. Marie. After 2½ years, he accepted the position as assistant general superintendent of the Illinois Steel Co., at Milwaukee.

A. J. Farabaugh has been appointed general superintendent of blast furnaces of the Bethlehem Steel Co.

Otto Abrahamson, treasurer of Beaudry & Co., Inc., Boston, has gone to Europe on a three-months' trip.

W. D. B. Motter Jr., who has been manager of the Canada Iron Mines, Ltd., Trenton, Ontario, has been appointed manager of the Benson Mines Co., Benson Mines, N. Y.

E. M. S. Young, general manager, the Standard Gage Steel Co., Beaver Falls, Pa., who was operated upon for appendicitis at Mercy hospital, Pittsburgh, several weeks ago is convalescing.

J. H. Gray, associated with W. R. Walker, assistant to the president of the United States Steel Corporation at New York City, sailed, last week, on the Vaterland for a month's vacation abroad.

Charles P. Perin, of 2 Rector street, New York City, consulting engineer of the Tata Iron & Steel Co., Sakchi, India, is leaving this week on a trip to India. Mr. Perin will stop in China and Japan en route.

Ralph Watson, assistant general superintendent of the Homestead works of the Carnegie Steel Co., who has been on a trip in the far east, has returned. Mr. Watson spent considerable time at steel works in India.

Richard Khuen, former division engineer for the American Bridge Co., at Pittsburgh, has been appointed general manager of the erecting department, succeeding the late Emil Gerber. L. H. Shoemaker has been named Mr. Khuen's successor.

H. C. Frick returned to New York the past week from a trip abroad. He expressed the opinion that business conditions are improving in several of the leading European nations and that in this country there will be considerable improvement over the remainder of the year.

Charles F. Rand, president of the Spanish-American Iron Co. and past president of the American Institute of Mining Engineers, has been made a member of the Order of Isabella Catolica and decorated by the King of Spain with the Grand Cross of Knight Commander.

Herman G. Kiefer, of the metallurgical department of the Timken Roller Bearing Co., Canton, O., was transferred June 1 to the plant of the Timken-Detroit Axle Co., where he will engage in similar work. Mr. Kiefer has been connected with the Timken companies for the past two and a half years.

Walter P. Burdick, recently elected member of the American Iron and Steel Institute, is first vice president of the Harrow Spring Co. with plants in Kalamazoo, Mich. Mr. Burdick has been identified with the steel industry for 30 years. Beginning as

W. P. BURDICK,
New Member of the American Iron and Steel Institute

bookkeeper in the office of this company, he rose to the general sales managership and later to the presidency. He is a self-made man, who has given expert attention to the application of spring and alloy steels for high duty service. He established the rolling mill department of this company, where spring steels, high carbon and special sections are now made. He has studied extensively the subject of heat treating, tempering high grade springs and alloy steels and is an authority on the manufacture of agricultural implement springs, automobile springs, special shapes and the fabrication of high carbon steel.

Outlook for Car Buying

Is More Promising—Awards of the Week Larger Than for Any Month This Year Except January

Awards of the past week of about 11,000 cars, representing a larger number than has been placed during any whole month this year, excepting January, has produced considerable satisfaction among equipment builders and steel makers. The New York Central System, which revived an old negotiation and bought 7,300 cars, is believed to have other purchases in view. The order placed included 3,400 box and 2,600 coal to the Big Four railroad and 900 box and 400 coal for the Boston & Albany railroad.

The outlook for car buying this month is more promising and among the lots now pending, which in all probability will be closed in June, are 800 for the Erie, 500 for the Delaware, Lackawanna & Western, 450 for the Seaboard Air Line and miscellaneous lots. Difficulty of financing purchases still is a problem for the railroads and some of the orders just closed depended upon special arrangements made through the builders. Should the rate decision come down this month, as expected, it is believed it will prove very stimulating to the equipment market.

The Pennsylvania railroad still withholds the distribution of the final portion of its season's rail order, but the indications are that this may come any day. The rail situation appears to be clearing and makers are looking for more tonnage to be placed shortly after July 1, when the railroads close their fiscal year.

Rail Situation at Pittsburgh

Mills rolling rails in western Pennsylvania have received better specifications thus far this month than last, but not much new tonnage is coming out. Demand for light rails and track material is comparatively light.

Rails for Ensley Plant

Birmingham, Ala., June 9.—An order for 8,000 tons of steel rails has just been received by the Tennessee Coal, Iron & Railroad Co. from the Seaboard Air line railroad. An order for 9,000 tons from the Frisco it is rumored, will be placed with the same company within the next few days.

Inquiry from railroads appears to be improving. Officials of the Tennessee company steel plant state that they feel reasonably sure of sufficient orders now on the books to guarantee operations until the latter part of August. By that time, more orders are expected, and probably some large ones, as it is understood that several lines contemplate entering the market for rails in the near future.

CAR AND LOCOMOTIVE ORDERS.

The Delaware, Lackawanna & Western railroad has put out a new inquiry for 500 box cars, and in addition, still figures on 200 automobile cars.

The Lake Champlain & Moriah railroad has placed 20 hopper cars with the Pressed Steel Car Co.

The Havana Central Railroad has ordered 350 flat, 40 caboose and 20 box cars, which is understood to have gone to the Standard Steel Car Co., and also about 50 narrow gage cars which are credited to the Magar Car Co.

The New York Central system has placed 4,300 box cars with the American Car & Foundry Co. and 3,000 coal cars for the Standard Steel Car Co., which largely are for the Big Four railroad.

The Illinois Central railroad has ordered 3,000 box cars, of which 1,000 went to the American Car & Foundry Co., 1,000 to the Western Steel Car Co., 500 to the Standard Steel Car Co. and 500 to the Haskell & Barker Co.

The Bingham & Garfield railway has ordered one consolidation freight locomotive from the American Locomotive Co.

The Carnegie Steel Co. has ordered three industrial locomotives from the Porter Co. and the Pittsburgh Limestone Co.

The Chicago & Northwestern railroad, which recently bought 40 locomotives from the American Locomotive Co., is considering increasing this total to 100.

The Kansas City Southern railroad is figuring on the purchase of 40 to 50 locomotives, but may not close for some time.

Warehouse Business Better

Steel warehouses in Chicago report an increase of almost 100 per cent in their local business on materials entering into building operations. Settlement of the brickmakers' strike has been effected and the result has been a great awakening of interest along this line. Delay has been serious and every effort is being made by constructors and owners to make up for lost time, warehouses feeling the effect of this in marked degree.

Warehouse business has been a little better in Cincinnati during the past week. Demand is mostly for structurals and reinforcing bars and for building materials in general. Specifications on old orders are better and new business shows a decided improvement. All prices are unchanged.

At New York, warehouse business is showing a substantial improvement. Some leading sellers in that district report the volume of their business in June is running one-third better than in May, which, in turn, was ahead of April. The quick deliveries by the mills, however, still work against the jobbers. Store prices at New York are unchanged.

METAL MARKETS

New York

New York, June 9.

Copper.—The report of the Copper Producers' Association, issued yesterday, tended still further to weaken the refined copper market. The report showed a decrease of more than 9,000,000 pounds in production, but due to a large decrease in domestic and foreign deliveries, stocks on hand June 1 showed an increase of 14,005,640 pounds, from the preceding month. The old price of 14.25c, usual terms, completely has disappeared and leading selling agencies now are asking 14c, delivered 30 days, without, however, attracting any business to speak of. The market continues weak and this price probably could be shaded. On a wholesale contract basis, we quote electrolytic 13.75c to 13.85c, cash, New York. Casting copper may be quoted at 13.75c, cash, and probably could be obtained for less. Prime lake may be quoted at 14.12½c to 14.25c, cash, with demand almost totally lacking.

Tin.—There is a rather scant supply of spot tin in this market and this is concentrated in a few hands, and were there any extended demand a premium probably would be asked on spot and nearby delivery. Owing to the fact that there is very little demand, however, quotations are as follows: Spot June and July, 30.75c; August, 30.87½c; September, 31c. The London market continues to fluctuate within rather wide limits at a low level. Today's London close was £138 15s on spot and £140 17s 6d on three months.

Spelter.—The tone of this market continues easy and good buyers find little difficulty in obtaining the metal at 5.07½c, and probably 5.05c, New York. We quote the market at 5.05c to 5.10c, New York. Demand is very dull.

Chicago

June 9.

Quiet continues to mark the metals market and prices are not materially changed from those prevailing for some time. Lake Copper is a shade lower and tin also has followed the decline in other markets.

We quote dealers' selling prices f. o. b., Chicago, as follows:

Lake copper, carload lots, 14.00c; casting, 14.00c; smaller lots, ¼c to ⅜c higher. Spelter, car lots, 5.05c; lead, desilverized, 3.80c; sheet zinc, $7.00, f. o. b. La Salle, in car lots of 600-pound casks; pig tin, 31.00c; Cookson's antimony, 7.25c; other grades, 5.-75c.

Entire quiet rules the old metals market in this territory and transactions are negligible. No changes have been made in quotations and prices are largely nominal as each transaction makes its own basis.

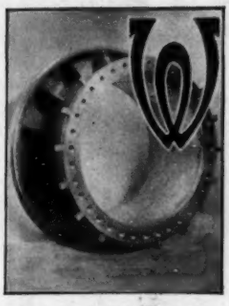
We quote dealers' selling prices, f. o. b. Chicago, as follows:

Copper wire, crucible shapes, 12.75c; copper bottoms, 12.00c; heavy red brass, 11.75c; heavy yellow brass, 9.00c; No. 1 red brass borings, 10.50c; No. 1 yellow brass borings, 8.00c; brass clippings, 9.25c; lead pipe, 3.60c; zinc scrap, 4.00c; tea lead, 3.50c; No. 1 aluminum, 14.00c; No. 1 pewter, 22.50c; block tin pipe, 30.50c; tin foil, 27.00c; linotype dross 3c; electrotype dross, 3c; stereotype plates, 4.25c; stereotype dross, 3c.

Making Heavy Bronze Valves--I

How Ten-Ton Bronze Parts for Riser Valves Are Molded and Cast in Dry Sand and Loam

BY H COLE ESTEP



WORK is now nearing completion at the plant of the Exeter Machine Works, Pittston, Pa., on one of the largest contracts for bronze castings that has ever been executed in this country. The heaviest castings that have been made weigh 19,700 pounds in the rough, or nearly 10 tons, and since the work was started over 1,000,000 pounds of bronze have been melted and poured into molds. The contract, which was let by the board of water supply of the city of New York, calls for six 72-inch bronze riser valves and 25 48-inch valves, weighing altogether over 375 tons. These valves form a part of the new Catskill water supply system for the city of New York. They are of the plug type, of a special design, which will be described later. There were so many difficulties surrounding the construction of the valves that, although the contract involved payments aggregating approximately $300,000, there were only four bidders.

The problems that have been solved both in the foundry and machine shop in executing this work have presented many interesting features and the foundry work, owing to the great weight of the castings and the large amounts of bronze melted, has been particularly unusual. The bronze has been melted entirely in crucibles in furnaces provided with special equipment for handling the molten metal rapidly. The melting loss has been less than 3 per cent, owing largely to the care taken in the operation of the furnaces. Most of the castings have been made in dry sand molds in solid flasks, except the shells for the 72-inch valves, which were molded in loam.

The Catskill water supply system is an enormous project, involving an expenditure of over $175,000,000. An aqueduct capable of delivering 500,000,000 gallons of water daily has been constructed between the Ashokan reservoir in the Catskill mountains and New York City, a distance of 127 miles. The aqueduct proper terminates at the Hill View reservoir, a short distance southeast of Yonkers, N. Y. From this point the Catskill water will be delivered to the five boroughs constituting the city of New York by a circular tunnel, which extends under the full length of Manhattan Island and continues across the East river through Brooklyn and under the Narrows to Staten Island. This tunnel has been driven in solid rock, its diameter ranging from 15 to 11 feet. Under the Narrows, the water will be carried in a special ball-and-socket joint, cast iron pipe, which is being made by the Westinghouse Machine Co., Pittsburgh, Pa. The water will be conveyed from the tunnel under the city to the surface mains in the streets through a series of vertical shafts, ranging from 218 to 752 feet in depth. The flow of water through the shaft will be controlled by the large bronze plug valves that are being made by the Exeter Machine Works. These valves are made entirely of manganese bronze, because it will be very difficult to repair them after they are once placed in service. They are designed for an operating life of 1,000 years.

A cross-section of one of the 72-inch valves is shown in Fig. 4. As indicated by this illustration, it consists of a large bronze shell, into which a spider, carrying a piston, 3 feet 9 inches in diameter, is secured. A cylinder, to which the valve plug is bolted, slides over the piston. The movement of the plug is steadied by a tail rod, which slides in a heavy bronze tripod. The entire valve, which is located at the bottom of the shaft several hundred feet below the surface, is encased in concrete. There are three 1-inch holes in the cylinder casing, through which water is admitted into the cylinder. The piston cover also is provided with three 1-inch holes, which allow the water to flow out above the piston as the valve closes. With the valve in its normal position, the water pressures are approximately balanced on both sides of the piston and the valve remains open by its own weight. If, however, an abnormally high flow occurs past the valve, the operating mechanism opens a pipe which connects the interior of the cylinder with the atmosphere. The resulting difference in pressure causes the valve to close. The holes for the entrance and egress of water are so propor-

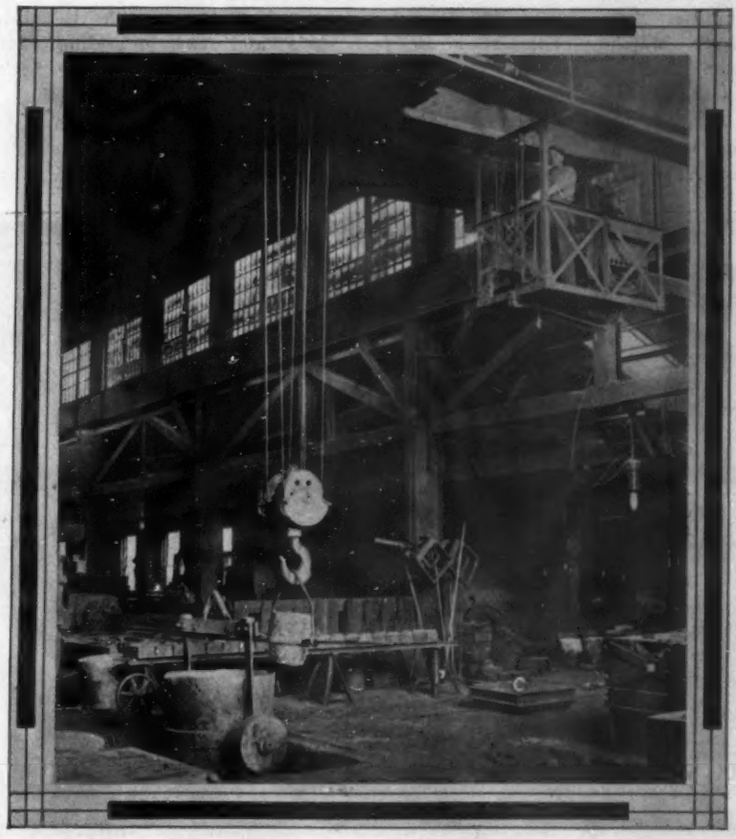


FIG. 1—TRANSFERRING 500-POUNDS OF BRONZE TO THE CRANE LADLE

FIG. 2—GENERAL VIEW OF BRONZE MELTING FURNACES

tioned that a closing period of 2½ minutes is provided under ordinary conditions, resulting in a water hammer of 35 pounds to the square inch. Even under abnormal conditions, the design is such that the water hammer cannot exceed 70 pounds per square inch. When it is desired to close the valve by hand for any reason, it is only necessary to allow the water to escape through the outlet pipe, thus reducing the pressure in the cylinder. This is accomplished by pulling a rod which works the operating mechanism.

To give some idea of the large amount of foundry work involved in making these valves, the rough and finished weights of the principal parts of the 48-inch and 72-inch valves are given in Table I.

Melt Both Bronze and Gray Iron

The foundry of the Exeter Machine Works is equipped for melting both gray iron and bronze. The building is 250 feet long and 110 feet wide. It is of the usual monitor type with a center bay 50 feet wide and two side bays each 30 feet in width. The main bay is served by two Niles traveling cranes having lifting capacities of 10 and 25 tons, respectively. The iron melting equipment includes two cupolas, one 42 inches and the other 48 inches in diameter; the bronze is melted in a large crucible furnace. The shop is provided with three mold drying ovens, the largest being 20 feet square and 12 feet high. The plant also has the customary equipment for making and drying cores of various sizes including both shelf and car ovens. The cleaning room equipment is modern and adequate. The traveling crane runway extends out over the flask yard east of the foundry building.

The specifications for the bronze valve castings are very rigid and each of the valves is subjected to severe

FIG. 3—MAIN BAY OF EXETER FOUNDRY SHOWING LARGE BRONZE MOLDS READY FOR POURING

tests before shipment. The work of casting and machining the valve parts is constantly supervised by a resident inspector representing the board of water supply and in order to fulfill the contract successfully, it was necessary that every casting be practically flawless. A special paragraph in the specifications states that patched or plugged castings will not be accepted.

Test bars or coupons are molded with every casting and are required to undergo a rigid physical examination. The minimum allowable tensile strength is 65,000 pounds per square inch, with the yield point at 32,000 pounds per square inch and an elongation in 2 inches of at least 25 per cent. The specifications also require that all of the bronze shall be alloyed with manganese or vanadium. It is further stated that all of the bronze castings shall be made of new metal, free from objectionable imperfections. Metal which shows signs of imperfect mixing on machining is rejected.

To produce castings which would measure up to the requirements of these rigid specifications, the Exeter Machine Works has installed a crucible melting furnace of special design. Although the weight of the metal involved was exceptionally large, it was decided at the outset that suitable, uniform results could not be obtained except by melting in crucibles in comparatively small quantities at a time.

The bronze melting furnace, Fig. 2, burns anthracite coal under natural draft, the stack being 30 inches in diameter and 110 feet in height. The fire holes are arranged in a single row and the entire construction of the furnace is simple and economical. Each melting unit is separated from its neighbors and consists simply of a cast iron frame supporting a circular grate and a brick lined fire pot. A subway is provided under the floor in front of the grates for the removal of ashes. The furnace is sufficiently large to heat 41 crucibles at one time.

Crucibles holding about 545 pounds of molten metal are used. The new crucibles are stored behind the furnace over the main flue, as shown in Fig. 2, where they undergo a seasoning process before being used. About 18 heats are obtained from each crucible before it is discarded.

A special arrangement for transferring the melted bronze from the crucibles to the large crane ladle has been devised and is illustrated in Figs. 1 and 9. A small floor-operated, one-ton traveling crane furnished by the Sprague Electric Works, New York City, serves the entire battery of fire holes. The pots are drawn from the fire by this crane and are conveyed to a small transfer car, *C*, Fig. 9, which carries them to the crane ladle situated in a pit under the main traveling crane runway. The span of the Sprague crane over the furnace is 12 feet and its runway is 200 feet long. It operates at a good speed and the metal is handled much more rapidly than would be the case by hand, or with the ordinary hand-operated chain hoist.

When pouring a large mold, the metal from a sufficient number of crucibles is first accumulated in the crane ladle by means of the Sprague hoist and transfer car system described. To pour a 72-inch valve shell, 21,000 pounds of bronze are drawn

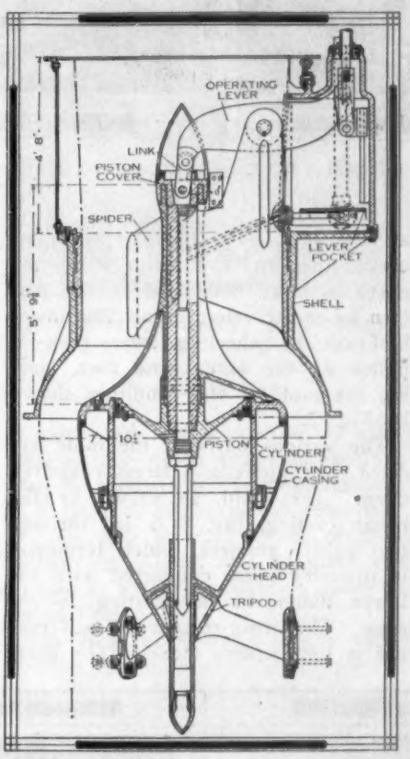


FIG. 4—SECTION OF 72-INCH RISER VALVE

from 41 pots and transferred to the main crane ladle in about 37 minutes. Eight minutes more are required to pour the metal into the mold, the whole operation occupying about three-quarters of an hour.

The Bronze is Carefully Mixed

The Exeter Machine Works do not use prepared ingots, but mix their own manganese bronze. The bronze from which all the riser valve castings were made contains six elements including copper, zinc, iron, tin, manganese and aluminum. In melting this mixture, it is the practice to make preliminary alloys of certain groups of metals, such as tin, iron and manganese, which are combined with the copper in the final melting. By means of this preliminary alloying, the difficulties resulting from the great differences in the melting points of the various constituents of the bronze are overcome, the subsidiary alloys having such proportions that their melting points are reasonably close together. In the final mixture, the copper is first melted in the crucible, after which the tin, iron, manganese and aluminum, suitably alloyed, are put in, followed by the zinc. Some additional tin is added just before removing the pots from the fire.

Table II gives the constituents of the bronze mixture as it is prepared for the crucible, together with a typical analysis of borings from a finished casting.

In the casting, it will be noted, the relative proportions, of copper, zinc and iron are less than in the original mixture, due to melting losses. Slight increases in the percentages of tin, manganese and aluminum are shown by analysis. A small quantity of lead which existed in the original mixture as an impurity appears in the analysis of the casting. From two to three hours are required to melt a 500-pound bronze charge. Except that the metal is thickly covered with charcoal, no great efforts are made during melting to avoid oxidation, but, as previously stated, the pouring operations are conducted as rapidly as possible to prevent deterioration in the quality of the bronze. The aluminum is added to the bronze because it aids in the production of a smooth, finished casting.

The pattern for a 48-inch valve shell is shown in Fig. 7. This shell is similar in form to the 72-inch shell, except that the bell of the latter is provided with 26 stiffening ribs. In the rough, the casting weighs 8,700 pounds and the finished shell weighs 4,900 pounds. The weight of the shrink heads, gates and risers, therefore, is 77½ per cent of that of the finished casting. This excess of metal is necessary to insure a dense, homogeneous product, free from shrinkage spots or objectionable cavities. In making the pattern, a shrinkage of 3/16 inch per foot is allowed for. The pattern for the 48-inch shell is over 3 feet high. It is 6 feet, 7 inches in diameter at the base and 4 feet, 1¼ inches in diameter at the top. The metal has an average thickness of 1½ inches. The casting is molded in a three-part, circular cast iron flask, the drag being 10 inches, the cheek 36 inches and the cope 10 inches in depth. The diameter of the flask is approximately 8 feet. The drag contains nothing ex-

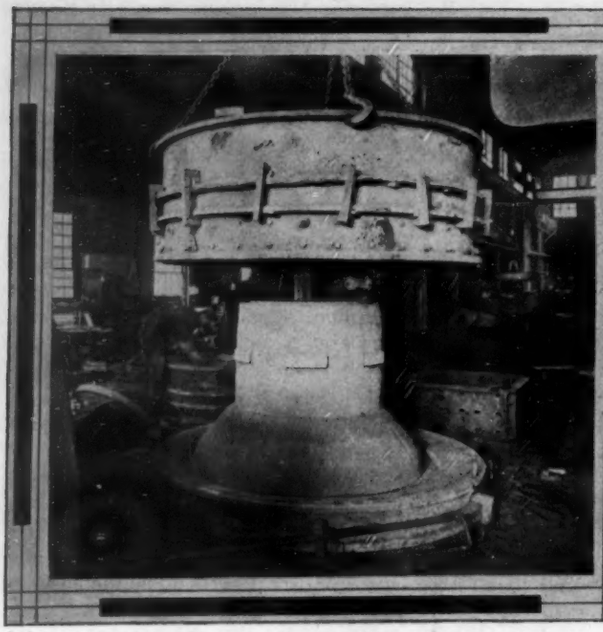


FIG. 5—REPLACING THE CHEEK ON A 48-INCH VALVE SHELL MOLD

FIG. 6—POURING 8,700 POUNDS OF BRONZE IN A 48-INCH VALVE SHELL MOLD

cept the lower flange of the shell. In making the mold, the drag is first set on the floor on a bottom board and filled with sand, after which the pattern is properly bedded in place. The cheek then is set in position and the pattern, which is hollow is filled with sand and rammed both inside and out. The cope, which contains nothing but a print for the large, annular shrink head, is set in place and rammed up after the sand in the cheek has been struck off.

When the ramming is finished, the cope is lifted off the cheek by the crane, exposing the pattern. The latter is divided in the cheek, as shown at *D*, Fig. 7. The top part is drawn out of the sand first, after which the cheek is lifted bodily off of the pattern by the traveling crane. The lower half of the cheek pattern then is pulled off the green sand core, leaving the mold in the condition shown in Fig. 5.

The various parts of the mold are dried over night in a large, coal-fired oven. The mold, as shown by the rough casting, Fig. 8, is fed through two square runners, which terminate in ordinary gates connected with the lower flange of the casting in the drag. The cross-section of each runner is four square inches. The gates are set tangentially to the flange, so that the metal is given a whirling motion as it enters the mold.

The large shrink head shown at the top of the casting in Fig. 8 is approximately 4 feet in outside diameter, 5 inches thick and 10 inches high. While the metal is solidifying, it is carefully fed from the shrink head. Two days are required to ram up the mold for a 48-inch shell, one molder and a helper being employed on the job. The 72-inch shells are swept in loam.

The other large bronze castings necessary for the construction of the 48-inch and 72-inch riser valves also

FIG. 7—THE PATTERN IS MADE IN TWO PARTS

FIG. 8—BRONZE RISER VALVE SHELL CASTING WITH GATES AND SHRINK HEAD ATTACHED

are molded in dry sand and are handled in a manner similar to the methods previously described.

In addition to its large bronze melting facilities, the foundry of the Exeter Machine Works is equipped to make large quantities of gray iron castings. At present about 26,000 pounds of gray iron are melted daily. This work presents no unusual features. The smaller dry sand cores are molded on a bench in the core department which is situated opposite the cupolas. The barrels containing core blacking are provided with compressed air jets for stirring the mixture. The large dry sand cores are molded on the floor along with the molds for the gray iron and bronze castings.

The plant of the Exeter Machine Works also includes a thoroughly equipped pattern shop located in a separate building, 90 feet long and 40 feet wide. It is situated adjacent to the foundry. This shop is equipped with the usual array of wood turning lathes, planers, jointers, circular saws, band saws, etc.

When the bronze castings for the riser valves are ready to leave the foundry they are transferred on an industrial railway to the machine shop where the necessary machine tool operations are performed and the valves assembled. The machine shop is 75 feet wide and 350 feet in length. It is thoroughly equipped with modern tools. Before each valve is shipped

Table I

ROUGH AND FINISHED WEIGHTS OF 48 AND 72-INCH VALVES

	Weight of rough casting with gates, risers and shrink heads attached, pounds.	Weight of finished casting, pounds.
72-inch shell	19,200	11,000
72-inch spider	15,200	8,700
72-inch cylinder	9,800	4,300
72-inch cylinder head.	5,500	2,500
72-inch piston cover..	3,300	2,500
72-inch piston	3,000	1,800
72-inch cylinder casing	2,750	2,000
72-inch lever pocket..	3,100	2,300
72-inch tripod	2,200	1,300
48-inch shell	8,700	4,900
48-inch spider	5,500	2,700
48-inch cylinder	4,400	.....
48-inch cylinder head.	3,100	.....
48-inch piston cover..	2,000	1,000
48-inch piston	1,250	.....
48-inch cylinder casing	1,900	1,000
48-inch lever pocket...	2,600	1,600
48-inch tripod	850	500

it is assembled in the machine shop and subjected to a rigid inspection to develop flaws in workmanship and material. These inspections are supervised by a representative of the board of water supply of the city of New York. Among other things, the specifications provide that a hydrostatic test pressure of 600 pounds per square inch shall be applied to the interior of the

FIG. 9—THE CRUCIBLES ARE PULLED FROM THE FIRE WITH A CRANE AND DEPOSITED ON A TRANSFER CAR

cylinder and maintained for 30 minutes, during which time the castings shall be water-tight. In order to pass this test, it is of course necessary that extreme care be used in the foundry in melting, mixing and handling the bronze to avoid any spongy spots in the castings.

The New York water supply valve contract has been executed under the general supervision of J. N. Thomas, president of the Exeter Machine Works, assisted by A. L. LeGrand, manager. The work of making the castings was under the direction of C. E. Schley, foundry superintendent.

Book Review

The Electric Furnace, Its Operation, and Uses, by Alfred Stansfield, D. Sc., Birks professor of Metallurgy in McGill university, Montreal, second edition, revised, enlarged and reset. Published by the McGraw-Hill Book Co., Inc., New York, and furnished by THE IRON TRADE REVIEW, at $4, net.

Dealing with a subject yet in an experimental stage where new things are constantly developing, and touching on an application of electricity to metallurgy which seems in its infancy and is growing month by month, the author labors under the disadvantage of not being able to keep up to the minute. Inasmuch as three years have been consumed in the preparation of this work the author has met difficulties in including the latest practice and discoveries in each section. Yet as far as possible he has endeavored to include the latest discoveries and perusal of the pages will indicate to the reader the success he has met.

With the development of large sources of electric current cheaply from water-power, smelting of metals by heat from the electric arc has been made possible in competition with heat from combustion of coal. In the commercial use of the electric furnace for producing various materials much experience and valuable data have been obtained and are presented in this volume which is authoritative and based on the work of many original investigators as well as the commercial experience of plants using this method.

The volume is most exhaustive, each step being buttressed by full reference to the investigations of pioneers in this branch of metallurgy and a full bibliography of the science.

The rapid growth of the electric furnace has made it difficult for the metallurgist to keep in touch with recent developments. Not many years ago it was a scientific curiosity and now it threatens to rival the Bessemer converter, the open-hearth steel furnace and even the blast furnace. So much that is visionary has been set forth and so much skepticism has prevailed as to the possibilities of the electric furnace, that this work is a valuable contribution to the literature of the subject, treating in scientific fashion the real facts and setting them forth for the student and metallurgist to use. The first chapter is historical, four

Table II

BRONZE MIXTURE USED

	Bronze mixture as prepared for crucible, per cent.	Analysis of resulting casting, per cent.
Copper	$6.00	55.80
Zinc	41.25	40.61
Iron	1.25	1.22
Tin	1.00	1.62
Manganese	0.25	0.45
Aluminum	0.25	0.27
Lead	0.00	0.03

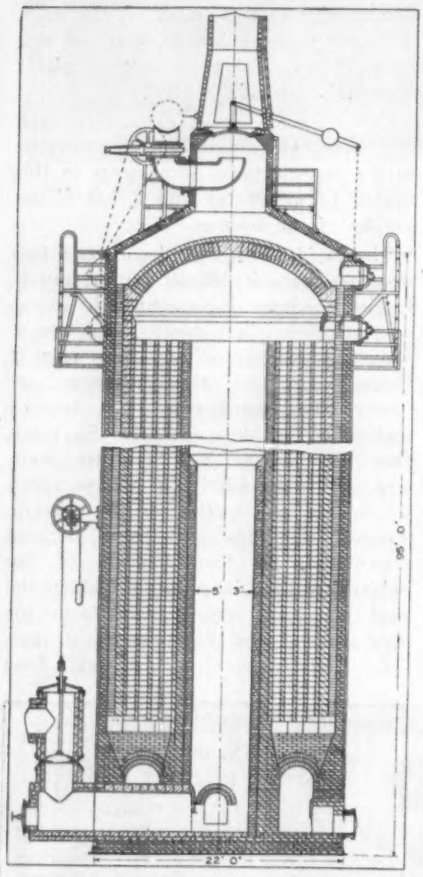
deal with the classification, efficiency, construction and operation, nine with various uses of the furnace and the final chapter is an attempt to look into the future.

Assuming that the cost of current is the greatest obstacle to wide commercial use of the electric furnace, the author calls attention to various methods of producing current from other sources

(*Continued on page* 1070*b*).

A New Three Pass Stove

A new three pass hot blast stove recently has been developed and patented by Searing & Coultas, engineers, Pittsburgh. A longitudinal section of the stove is shown in the accompanying illustration. The checkerwork and division wall are carried on radial walls which are arched above the dirt chamber. These arches are 9 inches thick, giving sufficient supporting strength and allowing plenty of space for dirt to drop to the chamber below. By carrying the checkerwork and the division wall on top of the radial walls, a large dirt



NEW THREE PASS STOVE

space is obtained underneath and the gas flows from the second to the third pass at a point above the dirt space. The change from the second to the third pass occurs at the same level all around the stove making all of the flues of exactly the same length. Therefore the stack draft is the same in all of the flues and an evenly balanced free passage of gases is assured.

The second pass checkerwork is bonded within itself and is independent of the well wall and division wall so that is rises and falls as a unit under varying temperatures. The skin wall around the well wall is designed so that the bricks are held properly in place. The division wall between the second and third passes is built of circular blocks which are kept from moving inward or outward by the radial walls in the checkerwork on the inner and outer sides. This is said to insure a tight wall free from leakage.

The outer or third pass dome is carried on a shelf angle which is a part of the steel shell. The dome may be rebuilt in sections without removing it entirely. The shell wall can rise and fall independently of the dome. The well and division walls are built as independent units, the space between them being used for the second pass checkerwork. The well wall or checkerwork may be removed and replaced without interfering with the adjoining units. The second pass checkerwork does not have to come level with the surrounding walls course by course and in an emergency, in the absence of regular checkerwork, standard 9-inch brick can be used in repairing the checkerwork.

It is said that owing to the construction in units, the walls will not be distorted by unequal expansion and contraction and this tends to lengthen the life of the brickwork.

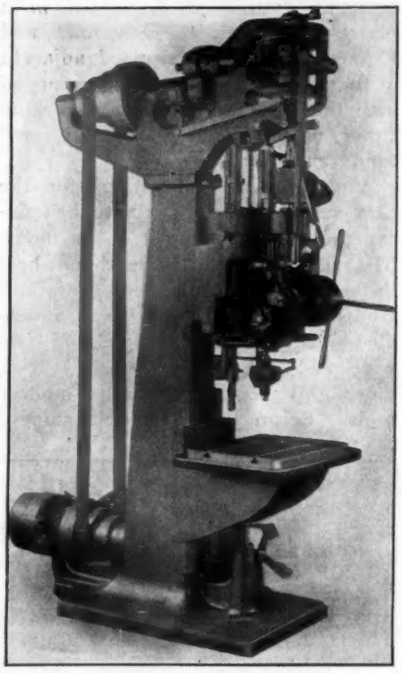
Automatic Vertical Turret Machine

The accompanying illustration shows a new automatic vertical turret, multiple spindle drilling and milling machine which has recently been placed on the market by the Turner Machine Co., Danbury, Conn. This machine is intended to complete a series of operations without shifting the position of the work or changing the tools. Each spindle carries a different tool which successively and automatically registers in the same position. It is said that the machine can be operated by an average workman at full capacity, producing accurate results.

The feed mechanism is driven from the vertical shaft which drives the spindle. The feed may be engaged and disengaged without stopping the machine, an automatic trip being provided to throw out the feed at a predetermined travel of the spindle. The feed gears are enclosed in a dustproof case and the machine is arranged for direct drive on the coarse feed. A total of 80 feed changes are provided.

The spindles may be fed either by the hand lever or hand wheel; the latter is more sensitive, thereby adapting the machine for profiling and similar milling jobs. The inactive spindles are locked in their extreme upper position, and as each spindle is automatically swung into its working position the lock is released and the weight of the spindle is carried by an adjustable spring. One spring is used for all of the spindles. The spindle projects approximately 1½ inches beyond the sleeve and a ball bearing is interposed between the nose of the spindle and the end of the sleeve. The sleeve is 12 11/16 inches long and the spindle has a bearing within the sleeve of 4 inches at each end. The end of the spindle is guided in the turret, which is 17 inches in length.

The back gears are operated by a Carlyle-Johnson friction clutch, and may be rocked out of engagement like



NEW VERTICAL TURRET MACHINE

the back gears of a lathe when they are not in use. The back gears are proportioned for low peripheral speed. The tapping gears, which operate the reverse of the tap or die at a ratio of 1.6 to 1, may be disengaged by means of an intermediate gear when not in use.

The slotted table is strong and well ribbed and has a working surface of 18 x 23 inches. A gear-driven oil pump with an oil tank and separate flexible oil supply pipes furnishes oil to the cutting tools. The table is separate from the knee and has a three-point support.

The Teller Iron Co., Chicago, has moved its offices to 647-648 First National Bank building.

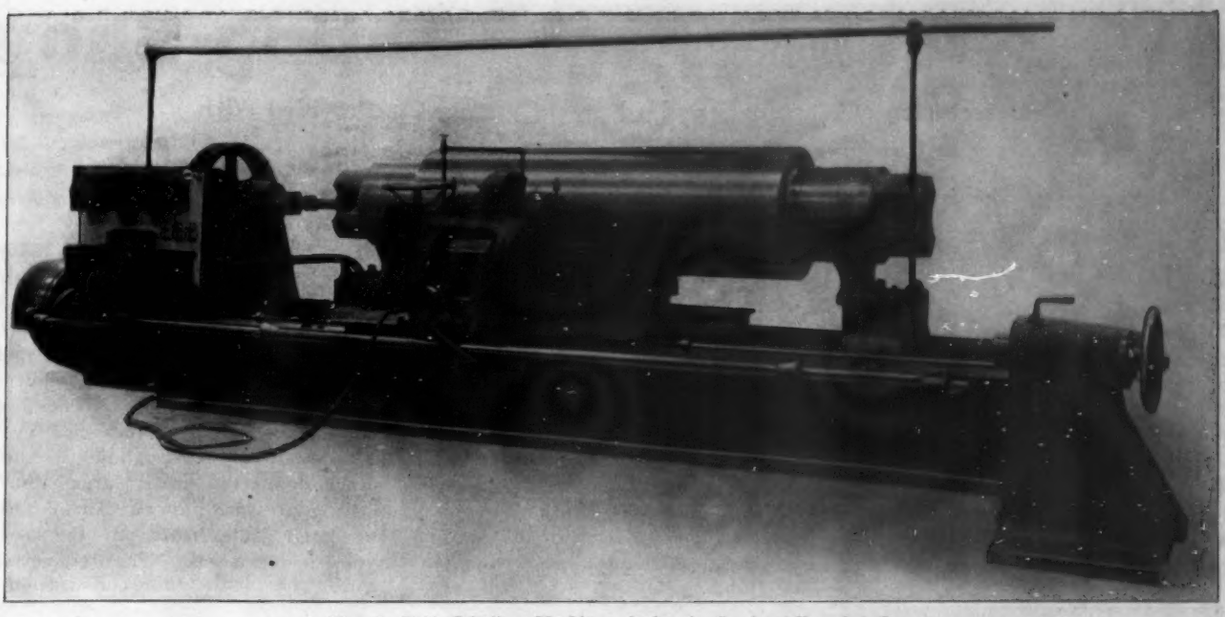


Fig. 1—Roll Grinding Machine of the A. Garrison Foundry Co.

New Motor-Driven Roll Grinder

A MOTOR-DRIVEN roll grinding machine for dressing chilled plate or sheet rolls recently has been developed by the A. Garrison Foundry Co., South Side, Pittsburgh. The machine is designed to grind and polish rolls on the body up to and including 32 inches in diameter and roll necks not exceeding 9 inches less than the diameter of the body. This roll grinder has sufficient power to take a roll directly from the mill and grind it accurately and rapidly.

The bed of the Garrison roll grinder is of the double box shape, having "V" ways provided with automatic oil wells. It is six feet wide and is built of cast iron. The carriage is reversed and the wheels fed in automatically at the end of each cut. Cross feeds are provided with micrometer adjustments and there is a hand feed for necking and grinding the fillets. The machine can be adjusted so that a roll may be turned hollow in the middle or "crossed", or may be tapered at the ends.

The gearing is of the herring bone type, and is cut from the solid in order to obviate chatter and to eliminate the usual wheel and worm. A substantial gear guard is provided.

The machine is equipped with two grinding wheels on opposite sides of the roll, this arrangement, it is claimed, making it possible to accomplish more accurate work. This particular construction makes it possible to grind a roll within 0.0005 of an inch. The grinding wheels are protected by cast steel hoods. The emery wheels are each 15 inches in diameter and are driven by motors located in the carriage, this location permitting the free use of a crane in placing rolls in position. The machine is driven by three variable speed motors, each acting independently. They are of special construction. The wheels are mounted on centers, making it possible to remove them with minimum loss of time. The wheel and arbor weigh less than 70 pounds.

A shift rod runs the entire length of the machine, making it possible to stop or reverse it without leaving the wheel to make the change at the headstock. The shaft rod does not interfere with the operation of the crane employed to place rolls in position for grinding.

The roll grinding machine being marketed by the A. Garrison Foundry Co. was developed by H. C. Shaw, vice president of the company. The machine weighs 40,000 pounds, including motors, wheels, pumps, etc.

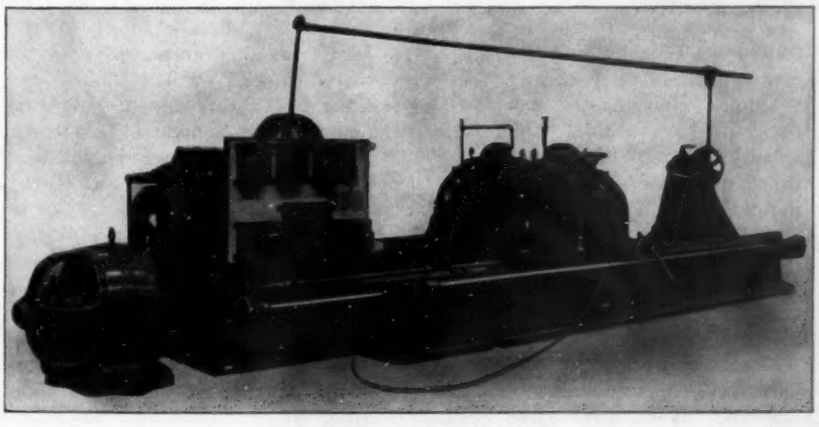


FIG. 2—CARRIAGE OF ROLL GRINDER

FIG. 3—DRIVE AND GRINDING WHEEL

A Cleveland Steel Casting Shop

Description of Plant of Standard Steel Castings Co. Provided With Equipment for Making Small Converter Castings

A NEW MODERN FOUNDRY, designed to supply converter steel castings from a few ounces up to over a ton in weight, is now being operated in Cleveland by The Standard Steel Castings Co. It is located at West Seventy-third street and Big Four railroad, where the facilities for the receipt and shipment of freight are unusually good. This condition, coupled with the fact that the plant is located in a district where the labor supply is adequate and the land values reasonable, makes the site a desirable one. The Standard Steel Castings Co. does a general jobbing business largely for customers in the Cleveland district and the northeastern part of Ohio. The shop turns out a large variety of automobile and light machinery work and a specialty is made of high carbon cast steel anvils and gears of all sizes.

The plant is situated on an irregularly shaped piece of ground approximately four acres in extent, bordered on one side by the main line of the Cleveland, Cincinnati, Chicago & St. Louis railway and on the other by West Seventy-third street. The main building, which extends parallel to the street, is 253 feet long and 80 feet wide with a lean-to on the west side used for bench molding, 80 x 253 feet. The offices, pattern shop, laboratory, etc., are located in separate buildings. Considerable area is available north and east of the existing structures for future expansion and it would be a comparatively simple matter to double the capacity of the plant by building an additional shop parallel to the present main building.

Location of Melting Equipment

The cupolas and converters are located at the middle of the main building so that both ends of the molding room may be conveniently reached when pouring. The melting equipment includes two 2-ton Tropenas converters, together with a cupola, blowers and other necessary auxiliaries. The arrangement of these parts is clearly shown in Fig. 2. The converters are of the standard, side-blow Tropenas type, electrically controlled, and are both operated from a single pulpit located just north of the ladle pits. The converters, instead of being elevated, as is sometimes the case, are located on the molding floor level and a large brick-lined pit has been excavated in front of each converter to receive the ladle when pouring. The iron is transferred from the cupola to the converters in a ladle by one of the traveling cranes. The cupola itself is of the type used with the Tropenas process. The charging floor is of steel plate construction served by an electric elevator and the iron melting equipment in general presents no unusual features.

The blower room is located immediately back of the converters and cupola. The blast for the cupola is provided by a Root's cupola blower driven by a 15-horsepower, Westinghouse 220-volt, three-phase, 60-cycle alternating current motor. The blast for the converters is furnished by a 75-horsepower Westinghouse motor, direct connected to a large Root's positive pressure blower. An oil-burning hand ladle heater of the usual type is installed. The converters are pre-heated by a coke fire. The main molding room, as mentioned above, is 80 feet wide and 253 feet long, and is used for floor molding of all kinds. It is served by two 5-ton traveling cranes, one of which was furnished by The Toledo Bridge & Crane Co., Toledo, O. The molding machine equipment in the main shop includes Osborn pneumatic jolt rammers and also Osborn roll-over machines of a standard type. Four 12 x 16 x 10-foot sand bins are located in the southeast corner of the shop and a Tropenas rotary sand mill is situated conveniently in front of the bins. The sand is transferred to the molding floors by the traveling cranes in wooden boxes holding about 1 cubic yard.

Most of the work is rammed up on

FIG. 1—MOLDING ROOM AT PLANT OF THE STANDARD STEEL CASTINGS CO.

the floor in the ordinary manner, according to the customary practice of steel foundries. A considerable proportion of the work is molded entirely in green sand. As mentioned above anvils constitute one of the specialties of the company. They are molded in dry sand in two-part flasks and set on edge, the pattern being arranged so that the anvil is molded face downward. This is in accordance with the usual method of molding anvils. The metal is fed through a vertical runner which connects with the horn of the anvil and a sound casting is insured by a large shrink head extending upward from the base. The latter is notched where it connects with the casting, so that it may be easily knocked off in the cleaning room.

Most of the small work is handled in the bench room, which, as mentioned above, is 80 feet wide and 100 feet long. The molders' benches are arranged on both sides of the room. This shop is served by a 5-ton Toledo crane. The sand is brought in at the north end in 1-yard boxes which are handled on an industrial track that extends across the molding room to the sand-mixing department. Most of the small work is dried and for this purpose two ovens fired by natural gas are situated between the bench shop and the main molding room. They are each 18 feet wide, 24 feet long and 10 feet high and are provided with rolling doors at each end, so that the molds may be placed in at one end and taken out at the other end and deposited on the floor of the main shop for pouring. The molds are transferred by the crane in the bench shop on specially constructed iron pipe carriers, each of which is large enough to hold several molds. The empty carriers are placed directly opposite the molders' benches and the molds are placed on them as soon as they are finished, so that only one handling is necessary between the bench shop and the main shop where the dry molds are poured. The practice of stacking the small dry molds has been tried, but has not proved an entire success owing to difficulties resulting from breakouts. It has, therefore, been abandoned.

For annealing finished castings to remove shrinkage strains, a natural gas fired oven fitted with a car upon which the castings are placed for annealing is provided. The scrap metal from the heads, instead of being poured into pigs, is poured in open molds into plates 3 feet square and 1 inch thick, which are later used for floor plates in various parts of the shop.

FIG. 3—A CORNER IN THE PATTERN SHOP

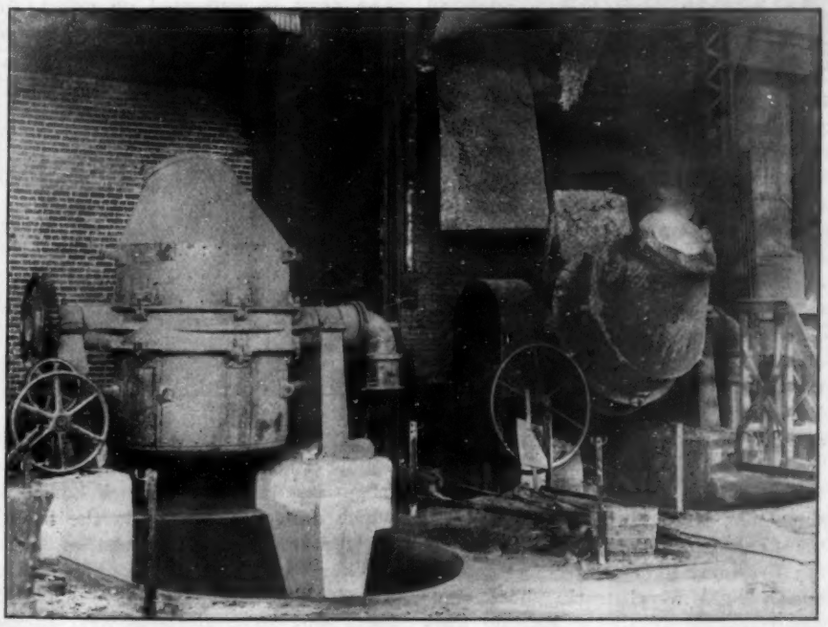


FIG. 2—TWO-TON CONVERTERS WITH LADLE PITS IN FOREGROUND

Cleaning Department

The cleaning department which occupies a portion of the northeast corner of the main building is completely equipped. The machinery includes three swing grinders, six double emery grinding stands, four shapers, hack saws, tumbling mills, etc. An electric arc welding apparatus is employed and some of the smaller castings are cleaned by a sand blast.

The core department includes benches for making smaller cores, and a three-compartment natural gas shelf oven. The larger cores are made on the floor or in the bench shop and are dried in the mold drying ovens.

The pattern shop is situated in a separate building alongside the railroad east of the foundry. It is approximately 50 x 60 feet in size and is well equipped with modern pattern making tools, including hand saws, buzz planers, jointers, circular saws, etc. The pattern building also includes suitable provision for the storage of spare patterns. A well-equipped chemical laboratory is situated near the pattern shop and all of the melting operations are controlled by analysis.

The officers of The Standard Steel Castings Co. include J. F. Janes, president; E. H. Janes, vice president; J. F. Devereaux, secretary; S. C.

Cutler, treasurer; and Thomas B. Lavey, foundry superintendent.

Electric Furnaces

The investigations that the Bureau of Mines is making into the metallurgical industries, the appliance of electricity to various processes, and especially in the manufacture of iron and steel, are given attention in Bulletin 67, "Electric Furnaces for Making Iron and Steel", just issued by the bureau. The investigations into electric furnaces for making iron were made by Dorsey A. Lyon and electric furnaces for making steel by Robert M. Keeney. The bulletin gives a historical review of the development of electric furnaces for making iron and steel, and discusses the problems which remain to be solved in the use of electric furnaces for the smelting of iron ores and the production of pig iron at a profit on a commercial scale. Mr. Lyon, in discussing the electric furnace for the making of iron, states that the electric furnace was not developed as a competitor of the blast furnace, but for the purpose of finding a furnace and a process that would be able to produce iron in those localities where blast furnace practice was not feasible, or where the increasing cost of suitable fuel was becoming prohibitive to the existing practice of smelting in blast furnaces.

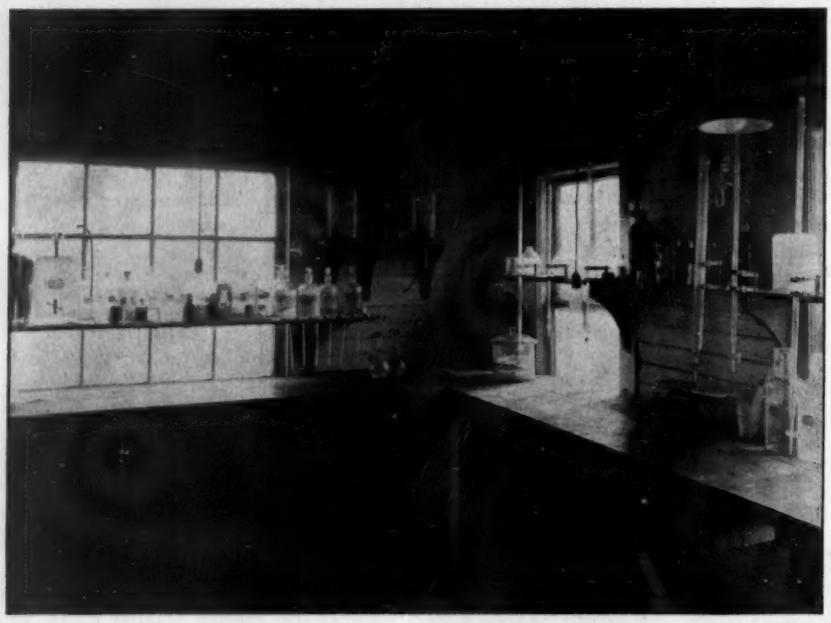


FIG. 4—LABORATORY FOR ANALYZING CUPOLA MIXTURES AND STEEL

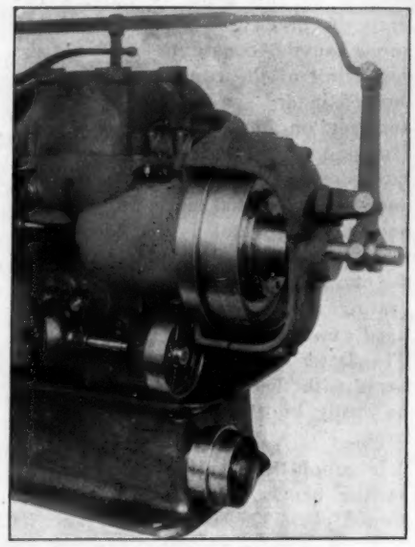
The Lake Shore Engine Works, Marquette, Mich., has recently completed three single drum hoists for a large iron mining company. The cylinders are 14¼ inches in diameter with an 18-inch stroke. The rope drums are 5 feet in diameter with 48-inch faces. The hoists are equipped with Baker pilliod reversing valve gears and the drums are keyed to the shaft.

Mechanical Reverse for Turret Lathes

The International Machine Tool Co., Indianapolis, has perfected a mechanical reverse mechanism for heavy duty turret lathes, which is said to do away with the necessity for a reversible counter-shaft, or a reversible motor, where frequent tapping operations, etc., are involved. The mechanism is of the planetary type and is similar in its operation to the reverse gears of certain types of automobiles. Section bands 7 and 8 inches in diameter, control the engagement of the various gears, thus operating the reverse mechanism.

Henry Disston & Sons, Inc., Philadelphia, recently opened the grounds of the new Disston Athletic Association. The new grounds were dedicated with appropriate ceremonies including a base ball game between the Wissinoming Field Club and the Disston team. Disston team won by a score of 5 to 2.

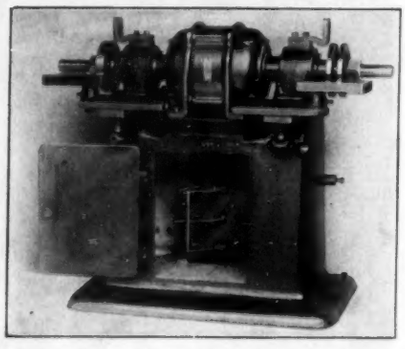
The Jackson Sand Mining Co., Jackson, Ohio, is improving its facilities at the Coalton quarry by installing a 20-ton Browning locomotive crane mounted on an eight wheel truck. This crane will take care of all car spotting work as well as its regular work, and three additional spur tracks are being constructed in the quarry to afford the crane additional facilities.



MECHANICAL REVERSING MECHANISM FOR TURRET LATHES

Ball Bearing Grinding Machine

A new motor-driven dry grinding machine has recently been placed on the market by the Ransom Mfg. Co., Oshkosh, Wis. It is designed for either belt or motor drive, with wheels 16 inches in diameter or larger. The machine shown in the accompanying illustration is suitable for operating two 24 x 4-inch abrasive wheels. The motor is securely bolted to the main frame of the machine. The rotor spindle is 2 inches in diameter at the wheel fit and 2⅝ inches in diameter between the bearings. The shaft is supported on either side of the motor by ball bearings of the double rim, self-aligning type. The ball races fit into 5 1/5-inch housings, which are held securely in the frame. It is stated that after one of these machines had been operated on heavy foundry grinding for five months there was no appreciable wear to the ball bearings.



BALL BEARING GRINDING MACHINE

American Blast Furnace Practice

Third Article Covering the Operative Procedure to Produce Iron at Lowest Cost

BY HERMANN A BRASSERT

PRACTICAL EXPERIENCE had developed the blast furnace to a remarkable degree of efficiency long before science attempted to shed any light on the process. In the old days the blast furnace was regarded as much of a mystery, and only practical men, through spending most of their lives with it, were capable of successfully controlling its whims. Good furnace men of this caliber were naturally scarce, and being rather jealous of their knowledge they were reluctant to teach others what they had acquired through years of hard work.

It was not until the middle of the past century that men of science gave to the industry a clear understanding of the important reactions in the furnace. This at once led to the realization that the process could be scientifically controlled, and soon the chemical laboratory was universally called upon to assist in regulating furnace operation. Then started a gradual transformation of furnace practice and, to speak in medical terms, the former curative or surgical methods were replaced by preventive treatment. The composition of the charges being known, the analysis of the resulting product could now be determined in advance, and its quality controlled with far greater certainty.

With the better selection and preparation of raw materials, more suitable furnace construction, better blowing equipment and stoves, the furnace operation became more and more a science; the more accurate knowledge as to the causes and effects of the detrimental reactions enabled the furnace manager to more successfully counteract them. While it was the essential qualification of the old type of furnaceman to be expert in getting a sick furnace out of trouble, a task at which he gained plenty of practice, nowadays scientific management is expected to keep the blast furnace out of trouble and through perfect control of raw materials and furnace practice establish a uniform, economical operation.

The foundation of a successful furnace campaign is laid by the utmost care and caution in blowing in. After a thorough drying of the lining the fire should be lighted simultaneously and uniformly all around the hearth and be given the opportunity to penetrate quickly into the center of the furnace. Whether a wooden scaffold is used for preheating the coke charges before they reach the bottom, or the hearth is filled with coke and a pipe is inserted through the tapping hole to carry part of the combustion downward, either method thoroughly heats the bottom and the first casts are of good grade and can be tapped without difficulty.

The proper stepping up in weight of burden and wind can only be established by experience. If in doubt, it is better to err on the slow side. In order to avoid channeling on the walls on the one hand, and building up on the bosh on the other, the tuyere area should be increased in proportion to the amount of wind blown.

To establish a low top temperature from the very first, the burden should be increased in advance of the wind. In this manner a new furnace can be made to carry the highest possible ratio of burden in the second week of operation. By gradually following with the wind volume and bringing higher blast heats into play, it is possible to maintain this heavy burden and reach

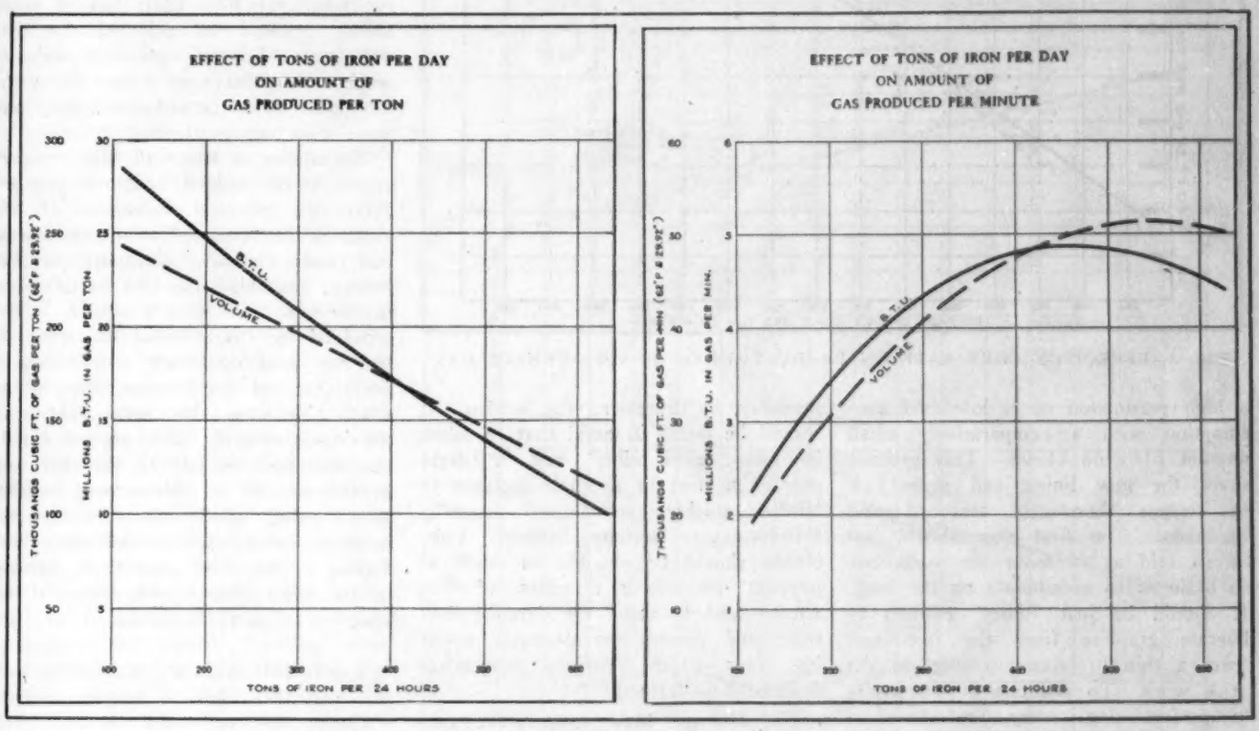

EFFECT OF TONS OF IRON PER DAY
ON AMOUNT OF
GAS PRODUCED PER TON
THOUSANDS CUBIC FT. OF GAS PER TON (60° F & 29.92")
MILLIONS B.T.U. IN GAS PER TON
B.T.U.
VOLUME
TONS OF IRON PER 24 HOURS
EFFECT OF TONS OF IRON PER DAY
ON AMOUNT OF
GAS PRODUCED PER MINUTE
THOUSANDS CUBIC FT. OF GAS PER MIN. (60° F & 29.92")
MILLIONS B.T.U. IN GAS PER MIN.
B.T.U.
VOLUME
TONS OF IRON PER 24 HOURS

FIG. 2—EFFECT OF OUTPUT OF FURNACE ON AMOUNT OF GAS PRODUCED

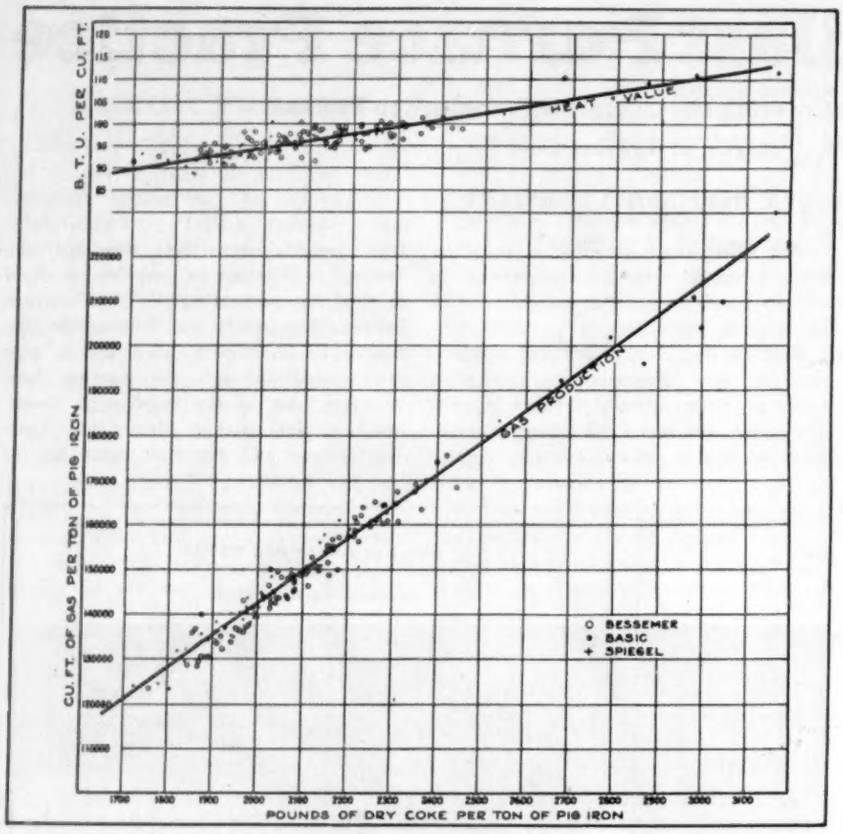

B. T. U. PER CU. FT.
HEAT VALUE
GAS PRODUCTION
CU. FT. OF GAS PER TON OF PIG IRON
O BESSEMER
• BASIC
+ SPIEGEL
POUNDS OF DRY COKE PER TON OF PIG IRON

FIG. 3—EFFECT OF COKE RATE ON PRODUCTION OF BLAST FURNACE GAS

a high production on a low fuel consumption with a comparatively small amount of wind blown. This practice saves the new lining and permits it to become thoroughly seasoned and hardened. The first slag should not be so acid as to scour the walls nor so basic as to accumulate on the bosh. It should be just "limey" enough to liberate graphite from the iron and form a thin protective coating on the brick work. To maintain a most nearly perfect slag, every preference in the selection of raw materials should be given to a new furnace. As the lining becomes older it becomes more seasoned and suffers less from variations.

After the furnace assumes its proper pace, which means such a rate of driving as can be maintained without decreasing the previously established maximum ratio of burden, there should be as few changes of any kind as possible. The most advantageous unit of burden charge must be established by experience for each type of furnace, as well as the best method of dumping, and these should be varied only if the necessity for a change is definitely proved.

Any change in the temperature and analysis of slag and iron should be promptly recognized and counteracted, at first by applying the reserve heat, then, if proper diagnosis indicates the necessity, by decreasing the burden. It should be borne in mind that "a stitch in time saves nine," and a slight change in heat or a small decrease in burden, quickly applied, will generally prevent more serious trouble. Coke blanks should be avoided as much as possible, as strong remedies of that nature tend to make the furnace fluctuate and disturb the desirable working lines which previous economical practice has formed.

The average blast temperature carried on furnaces burdened with Mesabi ores seldom exceeds 1,100 degrees Fahr., ranging far lower than the blast heats commonly applied in European practice, and also lower than on many of our Eastern furnaces using magnetic ores. This is due to the fact that with the easily reducible Mesabi ores very low fuel consumption can be attained with comparatively low blast heats, providing the distribution and the furnace lines are correct. In fact, it occurs that furnaces operating with high blast heats side by side with furnaces using low blast heats, will require more coke, simply because in the latter heating and reduction are carried on more economically. A good illustration of this is the difference in results on new against worn linings. The frequent failure to obtain any saving with high blast temperatures, coupled with the other common experience of Mesabi furnaces refusing to "take" the high heats has at many plants resulted in delaying the improvement of stove equipment and gas washing, so that even where the value of higher heats is recognized they are now often not available.

The ability to use high blast temperatures is determined by three factors: First, the physical condition of the stock in the furnace; second, the chemical and thermal conditions in the hearth; and third, the CO_2 to CO ratio in the gas. The first condition is determined by the physical character of the raw materials, their distribution in the stack, and the furnace lines, all of which influence the permeability of the stock column. The second condition is influenced by the fusibility and fluidity, as well as volume and basicity of the slag, which are generally determined by its duty of sulphur elimination. The third condition depends on the reducibility of the ores and the grade of iron to be produced.

Conditions Should be Uniform

Uniformity in every respect will greatly facilitate the use of high heats, even if one or the other of the premises mentioned should not be favorable. A sudden increase of blast heat raises the hearth temperature and renders

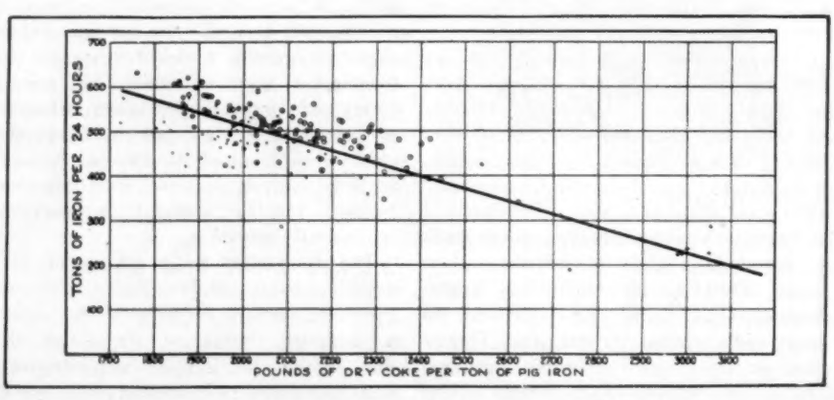


FIG. 4—RELATION OF OUTPUT TO COKE RATE

the slag more "limey" by reducing more silicon into the iron. With a dense stock column this will frequently cause an increase in blast pressure and will retard the action at the tuyeres, a condition which is aggravated by coke of slow combustibility and too small a cinder volume. A low percentage of slag will not only exaggerate the variations in analysis but will prevent the free descent of the stock and the desired penetration of the hearth, particularly when the shrinkage of the materials in the bosh through fusion is less than that required by the bosh angle. With high or flat boshes a greater cinder volume is necessary to insure smooth working with high blast heats than with low steep boshes.

Eventually the movement of the charges may stop altogether, and the furnace hangs. By then lowering the blast temperature the fusion zone can be extended until it reaches the plastic, limey agglomerations suspended in the bosh; and with the reduction of hearth temperature the slag again becoming more acid and fluid, the materials begin to melt and the stock column resumes its regular movement.

The greater the number of different elements contained in a slag the greater is its fluidity. This depends on the ability of the various components to enter into solution with each other, and must not be confused with the fusibility of slags. The latter is mainly determined by the chemical composition, and varies greatly with the proportion of the different components and their tendency to form new combinations with each other. The same element which in certain percentages will render the slag more fusible will, if present in different proportions, render it highly infusible. It is one of the blast furnace operator's chief duties to so select his burden that the resultant slag will have the most suitable fluidity as well as fusibility. A transgression beyond the established range of desirable fluidity and fusibility, in either direction, is detrimental.

To permit high heats being carried, and enable the furnace to work freely with a low melting zone, the slag must be kept uniformly acid. Once the melting process is carried too high up, the original bosh line is raised, the brick work above the bosh wears back, the bosh becomes too high, and any attempt to again lower the zone of fusion by the application of high heats and increased burden results in irregular operation by suspending the unmelted stock on the previously formed angle. This is why high heats cannot generally be used on a worn lining.

Under otherwise favorable conditions the use of high heats is often a matter of education on the part of the furnace crew. With the unavoidable variations in raw materials it is easier to operate on lower blast heats, a lighter burden, and with richer gases, because of the greater margin of safety with plenty of heat held in reserve. The use of very high heats requires constant watchfulness, and any slight change in the furnace must be quickly perceived and counteracted.

The slag must be kept uniformly acid, permitting the furnace to work freely with a low melting zone. Once the melting process is carried too high up, the original bosh line is raised, the brick work above the bosh becomes too high, and then any attempt to again lower the zone of fusion by the application of high heats and increased burden results in irregular operation by suspending the unmelted stock on the previously formed angle. This explains why it is generally impossible to use high heats on a worn lining.

The cost of heating the air increases with the degree of temperature, and simultaneously the coke saving decreases; so that in practice the economical limit of high blast heats generally lies below the theoretical one, which is reached when the gases lack the necessary preheating and reducing power. In the case of Mesabi ores, which are easily and quickly reduced by the gases, fast driving is possible without running into direct reduction; and lean gases, low top temperatures, and a low fuel consumption are reached by the use of moderate blast heats, as illustrated by the data of the South Works furnaces, given in Table VI. To indicate the extent of coke saving which is obtained, even in Mesabi practice by the application of higher heats than the average shown in Table VI, Table VII is presented giving the monthly practice of a Bessemer furnace using less than 1,750 pounds of coke per ton of iron.

Where less reducible ore mixtures are used, part of the reduction must be accomplished by solid carbon, the top gases are richer, and a much greater margin is left for fuel saving with high blast temperatures.

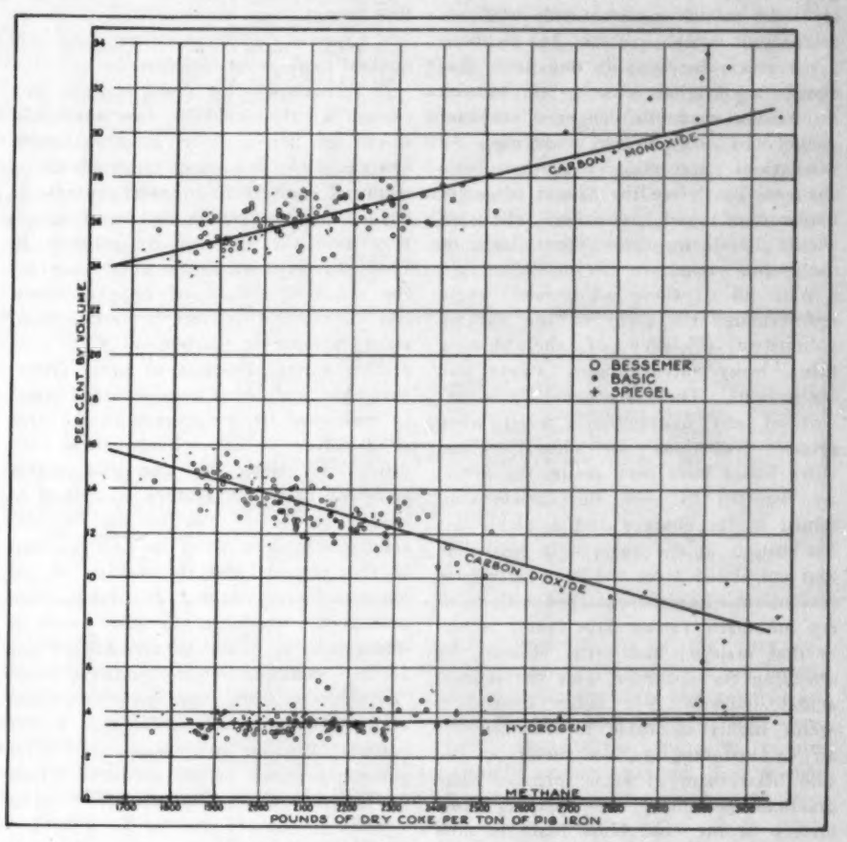


FIG. 5—EFFECT OF COKE RATE ON ANALYSIS OF BLAST FURNACE GAS

Constant Quantity of Air

Uniform furnace practice demands that the blowing engines be so generated as to deliver a constant quantity of air and not to maintain a constant pressure. The smelting of fine ores requires still greater care and accuracy in this respect, and this has led to the effort to deliver a constant weight of oxygen to the furnace at all times. Where the Gayley dry blast is used, this is accomplished simply by maintaining a uniform speed of the blow-

Table VI.

SOUTH WORKS ILLINOIS STEEL CO.

Average Blast Furnace Practice—Year, May 1, 1913, to May 1, 1914.

	Avg. daily prod.	Pounds per ton of iron. Ore scale cndr.	Coke.	Stone.	Excess of scrap used over prod.	—Percentages.— Flue dust prod.	Mesaba ore.	Actual yield.
Bessemer	501	4,136	1,927	863	23	207	73.9	53.63
Basic	493	4,471	1,961	849	51	160	85.5	49.08

	Cu. ft. of air per min.	Blast pres.	Temperature. Blast.	Top.	Analysis of iron. Sil.	Sul.	Mn.	—Analysis of slag.— SiO_2.	Al_2O_3.	CaO.	Mgo.
Bessemer	48,850	15.3	1,068	330	1.39	0.034	0.68	35.60	13.44	.....	2.06
Basic	45,660	16.3	996	266	0.97	0.038	1.72	34.71	14.48	.....	3.40

ing engines. Turbo blowers can be governed by a regulating device in the air inlet which automatically delivers a constant weight of air but without a correction for varying moistures. Reciprocating engines running on natural air can be made to deliver a constant weight of oxygen by varying the revolutions according to atmospheric changes. To derive the benefit of lower temperature and moisture, the air should be drawn from the outside of the engine room.

With all of these adjustments there still remains the error of the varying volumetric efficiency of the blowing tubes, leaky valves, mains, stoves and connections. These are generally in excess of any assumption. Even when proper deductions for clearance and valve losses have been made, the actual air required to burn the carbon contained in the charges and available for combustion at the tuyeres is less than that calculated from the blowing engine revolutions. Engines equipped with modern automatic valves show better results in that respect; and turbo blowers, by obviating the pulsation, give the highest actual delivery. For better control it seems highly desirable to measure the air by installing a flow meter in the cold blast main of each furnace. The practical possibility of applying flow meters to the cold blast main is now being demonstrated at South Works, where an instrument has been installed on one furnace and is giving very promising results. In Germany it is the practice at several plants to blow with all the gas engines into a common main for all furnaces of a group. The engines are operated at the most economical speed. The blast pressure is held uniform and slightly above the maximum furnace pressure. The volume of air for each furnace is regulated by an automatic valve in connection with a flow meter. This system should give good results at plants where the blast pressure varies but slightly, and in connection with gas engines which, on account of their low gas consumption, can be operated against an increased blast pressure without materially affecting the blowing cost. With steam-blowing engines, where the fuel consumption constitutes the largest item of cost, and in practice where the blast pressures vary, this method cannot be considered.

A furnace will, at times, without any change in the wind or raw materials, start to drive faster, taking more charges. In this case the carbon introduced with the additional rounds of burden is consumed in the direct reduction with the ores or by solution in CO_2. In the combustion at the tuyeres the constant weight of oxygen blown can combine with only a certain constant amount of carbon to CO, generating a fixed quantity of heat. Therefore, the additional coke charged must be consumed by the oxygen in the ores or dissolved by CO_2. Under these conditions a furnace will run cold, unless sufficient blast temperature is applied to balance the heat lost by the "direct" reduction and solution in CO_2 as well as that required for the melting of the additional ore charges. If enough blast heat is not available, the wind must be diminished in order to re-establish the former equilibrium of "indirect" and "direct" reduction, and avoid the necessity of lightening the burden.

Blast furnace operations are comparatively simple where the same grade of iron is made continuously. The practice becomes more intricate when frequent changes from one grade to another are required. Without good furnace lines it is impossible to vary the grades, without loss of quality and economy.

In merchant furnaces generally much smaller hearth dimensions are found than those which have been developed on modern furnaces connected with steel works, and higher or flatter boshes are frequently chosen, the former to accommodate the higher melting zone on foundry grades, and the latter to facilitate the production of basic iron, recognizing the value of low boshes but not the advantage of larger hearths. Such designs are poorly suited for successful operation on varying grades, particularly those which require basic slags. Merchant practice, above all others, demands lines which keep the furnace walls clean. The low, steep bosh accomplishes this, while the larger hearth favors uniformity of product and fuel economy. Foundry grades, spiegel, ferro-silicon, and ferro-manganese are being made in the large hearths of modern furnaces with excellent results, surpassing those obtained on smaller furnaces especially designed for such practice.

In producing these grades, the first step is to so modify the physical and chemical quality of the slag as to make it most favorable to the transfer of the desired elements into the iron, and to the elimination from the iron of those ingredients which are not wanted. For instance, in high silicon Bessemer or foundry practice, a much lower fuel consumption can be obtained if, by a decreased proportion of bases in the slag its ability to retain silica has been lessened, thereby favoring the reduction of silicon into the iron. Lower fuel consumption and higher blast heats will then assist in concentrating the melting zone and maintaining a high hearth temperature,

Table VII.

MONTHLY PRACTICE AT SOUTH WORKS.

	Avg. daily prod.	Pounds per ton of iron. Ore scale cndr.	Coke.	Stone.	Excess of scrap used over prod.	—Percentages.— Flue dust prod.	Mesaba ore.	Actual yield.
"E" Fce.:								
Sept., '13	525	4,012	1,691	677	88	175	92.9	53.24
Oct., '13	514	4,047	1,711	774	113	171	93.0	52.85
Dec., '13	536	3,852	1,705	780	109	201	83.7	55.69
No. 4 Fce.:								
Mar., '14	518	4,062	1,744	781	17	193	67.4	54.76
Apr., '14	543	4,003	1,702	752	73	227	66.5	54.40

	Cu. ft. of air per min.	Blast pres.	Temperature. Blast.	Top.	Analysis of iron. Sil.	Sul.	Mn.	—Analysis of slag.— SiO_2.	Al_2O_3.	CaO.	Mgo.
"E" Fce.:											
Sept., '13	47,750	15.1	1,225	317	1.30	0.034	0.61	36.25	10.21	45.58	2.13
Oct., '13	46,390	16.2	1,251	306	1.48	0.043	0.60	37.40	11.47	46.55	2.07
Dec., '13	45,510	15.7	1,250	300	1.33	0.041	0.71	36.12	11.48	48.46	1.96
No. 4 Fce.:											
Mar., '14	41,140	15.7	1,170	274	1.29	0.025	0.59	33.48	15.67	45.39	3.85
Apr., '14	42,950	16.0	1,196	283	1.23	0.027	0.56	34.63	15.01	45.63	2.83

which will increase the ability of the leaner slag to dissolve and retain the sulphur, resulting in a uniform grade of low sulphur iron. The production of high grades of ferro silicon is made possible only by a large preponderance of silica in the burden and slag. Even then, the highest blast temperatures are required to reduce economically large quantities of silicon.

In spiegel and ferro-manganese practice where it is desired to reduce the maximum amount of manganese into the product, with the least loss of manganese in the slag, a very basic slag must be carried. By the utmost concentration of heat in the hearth through the use of the highest blast temperatures, the slag can be kept sufficiently fluid, in spite of being very "limey," and the manganese in the slag can be held uniformly below 6 per cent. The loss of manganese in the gases, which occurs more or less in proportion to the top temperatures, is reduced to a minimum by concentrating the zone of fusion and thereby lowering the top temperature. By charging suitable percentages of raw coal, the distillation of which consumes heat, the top heats can be still further reduced. The temperature of the escaping gases can in this manner be kept below 600 degrees Fahr., even when producing 80 per cent ferro-manganese; and the gases, which are generally dark yellow or brown, can be observed issuing from stove and boiler stacks with but the faintest tint of yellow.

In Table VIII are some results recently obtained on No. 1 furnace at the South Works, which illustrate the practice just described.

On the same lining this furnace had previously produced 644,815 tons of Bessemer, basic, spiegel, ferro-silicon and ferro-manganese, which illustrates the possibility of making use of old linings for the manufacture of special grades.

A furnace campaign, however, should never be continued after the lining has become so worn that further economical practice is impossible. The expenditure for relining can be made comparatively small if the furnace is constructed with this point in view and can generally be saved in a few months by the lower cost resulting from better practice.

The unwarranted prolongation of furnace campaigns on worn-out lines is often a source of enormous losses in the manufacture of iron, and one which seems to be frequently overlooked in the effort to achieve a large production on a lining. It is poor policy to set a standard tonnage for a campaign, since one of 300,000 tons may be more destructive to the furnace walls than another of twice that tonnage. The economy of practice alone should determine the end of the furnace campaign. The vainglory of accumulating a large tonnage on a lining is a poor compensation for losing money, as well as the furnace organization's pride in a low fuel consumption.

The possibility to maintain low fuel consumptions on furnace campaigns, and still reach high tonnages, is demonstrated by the following records as at May 1 of present campaigns of blast furnaces at the South Works of the Illinois Steel Company:

	Total Production	Agv. Coke Consumption
No. 1 Furnace—Operating on special grades.		
No. 2 Furnace.....	475,442 tons	2,044 lbs.
No. 3 Furnace.....	788,512 tons	2,056 lbs.
No. 4 Furnace.....	36,414 tons	1,806 lbs.
"E" Furnace.....	417,117 tons	1,939 lbs.
No. 5 Furnace.....	41,252 tons	1,944 lbs.
No. 6 Furnace.....	247,572 tons	2,116 lbs.
No. 7 Furnace.....	279,639 tons	1,975 lbs.
No. 8 Furnace.....	223,175 tons	1,923 lbs.
No. 9 Furnace.....	593,007 tons	2,028 lbs.
No. 10 Furnace.....	205,698 tons	2,005 lbs.

Furnaces Nos. 2, 6, 9 and 10 were blown out last winter on account of business conditions and not on account of worn-out linings. The others are still operating.

In blowing out, the temperature of the escaping gases should be kept so low as not to cause any damage to the furnace top. This is accomplished by spraying water on the bell and the descending stock, and gradually decreasing the wind volume. Accumulations on the walls of stack and bosh should be cleaned off in the process of blowing out by using an acid slag and short tuyeres. A suitable quantity of fine materials, such as boiler ashes or granulated cinder, charged on top of the final rounds of burden, will keep the blast pressure sufficiently high, even when the stock line approaches the tuyere level, to allow most of the iron and slag to be lifted out of the hearth during the last cast. This applies only to American practice where the tapping hole slants downward. In this manner a large amount of the labor for cleaning out the bottom can be saved. The danger of gas explosions is avoided by filling the gas flues with steam before any air is allowed to enter.

By modern utilization of the by-products, their disposal, formerly a source of expense in the operation of a blast furnace plant, has been converted into a handsome profit. The furnace gas is the most conspicuous in this respect. It has become a potent, economical factor as the source of power for steel works and other industries or public utilities located in the district.

Gas Volumes

The rate of gas production and its total B. T. U. value is a function of the coke consumption, as well as of the pig iron output. Extensive tests were conducted at the South Works to establish the relation of these items in our Mesabi practice and to determine the amount of surplus gas for the production of power which would be available from our furnaces under various conditions of practice. For two full years, 1911 and 1912, on all blast furnaces of the plant making basic, Bessemer and spiegel, continuous gas samples were taken and analyzed every 24 hours and the results were averaged for each month. The averages are plotted on Fig. 3, each point representing a full month's operation of a furnace. On these averages and the monthly performance of the furnaces, the diagrams of Figs 2 to 5 are based. These show successively the relation of gas volume and heat value to coke consumption and that of pig iron output to coke consumption, and the volume and total calorific value of the top gases.

These diagrams show that the gas volume per ton of iron and the calorific value per cubic foot of gas increase with higher coke rates, but that the fuel consumption, in our practice, decreases with an increase in output. It is this latter relation which turns downward the curves at the right in Fig 2, representing the amount and calorific value of the top gas per unit of time. These and the line at the left in Fig 2, which show the same items per unit of product, distinctly prove that with larger output, the amount of heat per ton of iron carried off with the top gases, decreases, and clearly demonstrates the economy of fast driving with Mesabi ores.

The heats of combustion of the constituent gases were taken as follows,

Table VIII.

PRACTICE IN MAKING ALLOYS.

	Total tons.	Daily average.	Coke per ton.	Coal per ton.	Temperature Degrees Fahrenheit. Blast.	Top.	Average grade, per cent Mn.	Per cent Mn. in slag.
Ferro-manganese, Dec., 1913	3,870	125	3,896	288	1,470	550	80	5.81
Spiegel, Feb.-Mar., 1914	6,528	272	2,858	...	1,167	607	19	2.18
Ferro-Silicon Mar.-April, 1914	7,396	161	3,867	...	1,214	676	Sil. 11	....

sensible heat due to top temperatures not being considered:

CO..... 324 B.t.u. per cu. ft.
H_2..... 275 B.t.u. per cu. ft.
CH_4..... 915 B.t.u. per cu. ft.

The computations of gas production are made on the basis that the carbon charged as coke reappears in the gas, assuming that the weight of carbon in the limestone is equal to the carbon in the pig iron and flue dust produced. The error of this assumption is less than 1 per cent.

The following is an example of the method of calculating the volume of gas: Tons Bessemer iron produced per day, 552.5; coke rate, pounds per gross ton, 1,988; carbon in coke 88.72 per cent.

Analysis of gas:

	Per cent
CO	25.8
Co_2	13.6
H_2	3.0
CH_4	.2
N	57.4
B.T.U. per cu. ft.	93.3

Cu. ft. gas per ton of iron,

$$\frac{1{,}988 \text{ lb. coke} \times 88.72 \text{ Per cent C}}{(25.8 \text{ Per cent CO} + 13.6 \text{ Per cent } CO_2 + .2 \text{ Per cent } CH_4) \times .0315} = 141{,}400$$

The constant 0.0315 is the weight of carbon in a cubic foot at 29.92 inches barometer and 62 degrees Fahr. of any gas in which there is one atom of carbon per molecule. All volumes are referred to 62 degrees Fahr. and 29.92 inches barometer.

The following formulæ are based on these investigations, R being pounds of dry coke per ton of pig iron and T being tons of iron per 24 hours.

(1) B.T.U. per cu. ft.=0.016 R + 62.5.

(2) Cu. ft. gas per ton iron=71.4 R.

(3) B.T.U. in gas per ton iron=1.143 R^2+4,462.5 R.

(4) Cu. ft. air at tuyeres per ton iron =51.4 R.

(5) Cu. ft. air per minute=.0357 R T.

Fig. 4 shows the relation of coke rate and tons iron per day during the performance of the same furnaces for the same period as shown on Figs. 3 and 5. The mean line drawn through these points has the formula

(6) $T = 1{,}090 - .2875\ R$

or,

(7) $$R = \frac{1{,}090 - T}{.2875}$$

Combining (7) with (2) and dividing by 1,440 minutes gives

(8) Cu. ft. gas per min. = 188.1 T — .1,726 T^2 which is plotted on Fig 2. Further, by combining (8) with (1) and (7) gives

(9) B.T.U. per min. = 23,155 T — 31.705 T^2 + .00960 T^3.

From (2) and (7) Cu. ft. gas per ton iron = 270,710 — 248.35 T.

While from (3) and (7) B.T.U. per ton iron = 33,350,000 — 45,670 T + 13.83 T^2.

The curves on Fig. 2 show that the amount of gas, and still more, its calorific value, is practically constant within the range of our usual daily variations of pig iron production. This feature is of special interest where other industries rely upon the blast furnace for a constant supply of power.

The nitrogen content of the gas, determined by difference, if plotted in conjunction with the CO_2 to CO lines on Fig 5, forms an almost horizontal line. This indicates that the air requirement per unit of carbon, in the practice represented by the test period, was almost constant. Even when the proportion of "direct" reduction was increased through fast driving, this evidently did not decrease the amount of carbon which reached the tuyeres appreciably more than the dissolution of carbon by CO_2 in the practice with higher fuel consumption, due to poorer coke or worn out lines. In the former case, the carbon, as well as the heat consumed by direct reduction, was replaced by an increase in blast temperature, smaller radiation losses, and other advantages derived from fast driving. In the latter, the loss of carbon was replaced by an increase in coke consumption.

Recent experiments at South Works and Gary have proved that in times when there is no demand for the pig iron, the production of power can be maintained by converting a furnace stack into a gas producer, charging a mixture of coke, coke breeze and coal with open hearth and other waste slags as flux.

The latest development in Germany is the mixing of blast furnace and coke oven gas. By automatic regulation the most desirable heat value can be uniformly maintained. The use of furnace gas or mixed gas for the heating of coke ovens makes a larger amount of the richer coke oven gas available for outside use, as for instance, municipal heating and lighting. The higher and more constant heat value of the mixed gas also solves the problem of efficient gas engine operation in large electric power plants, where uniformity of speed is the first requirement.

Many blast furnace slags can be used for the production of cement, an industry which has been developed to large proportions in this country and abroad. Another profitable outlet for the slag, frequently found in Germany and undoubtedly applicable to many plants in this country, is the manufacture of high grade building brick.

The increased output of modern furnaces, coupled with the many labor saving improvements, has lowered to a remarkable extent the cost of operation per ton of iron. The vast array of common labor which formerly performed the hardest, roughest, and most dangerous duties around a blast furnace, has been eliminated, and their places have been taken by fewer men of higher skill. The operation of charging our furnaces has reached such a remarkable degree of perfection, that three men are able to fill two 500-ton stacks, and do it with greater accuracy, better control, and less physical effort than ever before.

Number of Casts Decreased

Suitable hearth construction has decreased the daily number of casts. At several plants only four casts are made in twenty-four hours. At the South Works three casts per day is the rule, 150 to 200 tons and more being tapped at a time. It is quite possible that in the future, with further enlargement of the crucible, no casts will have to be made on the night turn. Big ladles and mixers of large capacity are indispensable in this development. The latter have the further advantage of eliminating the most objectionable and wasteful part of blast furnace operations—the casting in sand beds of pig machines and the remelting of a considerable portion of the product. In Germany some plants to-day have a sufficient mixer capacity to hold all the Sunday iron for direct conversion.

To achieve uniformly good practice nothing is more essential than the building up of an intelligent, watchful and active furnace organization. The close co-operation of the foreman and the crew is needed to control efficiently every step in the operation. So much depends on correct discernment and quick action that an alert crew will in a day's work avert many troubles. Being continually in close contact with the furnace, they must be relied upon to watch the many little, yet important details of operation.

The furnace manager who does not devote as much of his thought and energy to studying and improving his organization as he gives to correcting the design of his plant, misses one of his best opportunities. Any effort on his part to instill into his men a keener interest in the efficiency of the plant will make his task the easier. Modern mechanical appliances have raised the standard of the men employed around a furnace; to keep their intellect alive and bent to their work in the command of economy and progress. Some of the

best suggestions for improving operation and construction are obtained from the rank and file of the organization.

A crew which works convinced that their employer takes an interest in their welfare, will perform its duties willingly and cheerfully, and therefore efficiently. With the assistance of modern engineering, the safety campaign has not only succeeded in making the blast furnace plant, which in former days abounded in dangers, a safe and healthy place of work, but has exercised a most beneficial influence on the spirit and progressiveness of blast furnace organizations, especially where safety matters have been referred to the workmen themselves for suggestions and improvements of their own.

The betterment of the human element, which enters into every step of the process from the mining of the raw materials to the casting of the molten product, perhaps does not stand out as strikingly as the more apparent results achieved by modern engineering; yet great progress has in recent years been made in this direction, and the good results obtained in modern blast furnace practice are in no small measure due to the better spirit and greater intelligence of the workers.

In every art and industry the living generation, having achieved a certain goal, is prone to believe that no further progress is possible. At the present time, with furnaces producing 500 tons and more daily from difficult ore mixtures, with fuel consumptions which we think closely approach the low limit, we may not see our way clear to further improvement; yet the possibilities are now as great as ever. Perhaps they lie in another direction, and we need not be discouraged if we fail to develop the 1,000-ton furnace or are unable to lower our past fuel records.

Our problem, I am convinced, is to reclaim and put to use those vast bodies of ore and coal which, owing to their adverse character, have in the past not been available for the manufacture of iron. This is by far our greatest task, a task which has the highest economic value in substantially contributing to our country's wealth.

The magnitude of the unit with which we deal, the large responsibilities involved, the long period of time which must elapse before new ideas are approved by practice or condemned, the many disappointments with which all of us have met, are bound to make us cautious and conservative. Yet in this age, where science and engineering have put at our command resources undreamed of by our predecessors, we will, I trust, in the daily drudgery of making pig iron, keep sight of our wonderful opportunities and do our share in advancing the blast furnace art.

Large Exhibit

Will Be Made at Exposition by Steel Corporation

The iron and steel industry will be given a prominent place among the various attractions at the coming Panama Pacific International Exposition, at San Francisco, next year, by the comprehensive exhibit of the United States Steel Corporation and subsidiary companies.

A general committee headed by A. T. DeForest, of the United States Steel Products Co., of San Francisco, has been handling the work, H. V. Jamison, advertising manager of the American Sheet & Tin Plate Co., of Pittsburgh, has just been appointed director of exhibits for the entire Corporation, and at present is busily engaged mapping out plans for the

H. V. JAMISON

exhibits of the verious companies. Among the features which will be shown will be the process of manufacturing iron and steel products, from the ore mines to the production of the hundreds of products of the Corporation. It is intended to show how the ore is transported both by rail and water, the dock operations, the production of coal, coke and pig iron and thence to the specialized lines of manufacture. The exhibit will even go so far as to show how the by-products are produced and will show many of the products in practical use.

A motion picture show will be part of the exhibit and through this medium will be portrayed the operations of the Corporation throughout all its departments. In the pictures will also be shown the great benefit to the social world brought about by the United States Steel Corporation. The Corporation's many devices for insuring safety of employes will be exhibited and data will be given as to the large amounts expended for this purpose.

This is the first time in the history of the steel industry that the United States Steel Corporation has planned a comprehensive exhibit or display of any kind embracing all of the subsidiary companies. It is certain that this feature of the coming exposition will make a strong appeal to visitors at San Francisco in 1915.

Larger Stocks

Than Usual Carried Last Year by Harvester Company

Partial crop failures and general business conditions throughout the year of 1913 resulted in the falling off of demand for certain lines of farm machinery and in a larger inventory of raw materials and finished product than would be carried under normal conditions, says President Cyrus H. McCormick, in the first annual report of the International Harvester Co. of New Jersey. This corporation represents about one-half of the assets of the old International Harvester Co., which was divided into two companies in 1912.

The total sales of machines, repairs and twine made by the company in 1913 were $66,699,000. The company also sold the International Harvester Co., the foreign branch of the business, goods amounting to $16,462,000. The company's net earnings were $7,915,525, which, after the payment of dividends of $4,100,000, left a balance of $3,815,525 for the surplus account. Assets were $129,938,595, compared with $242,920,543 of the combined companies a year ago. The real estate plants, ore, coal and timber properties of the companies are worth $51,179,322.

In the final step of merging the Erie board of trade and Erie chamber of commerce into the Erie board of commerce, more than 400 of the 1,200 members from the manufacturing interests were recognized in the election of William Hamilton, president of the Erie Car Works, as the second vice president.

The new "car" shop of the Otis Elevator Co., at Harrison, N. J., is fast approaching completion, but it probably will be two months or so before operations will be commenced in it. The building will be used for assembling elevator cars.

New Plan to Forecast Production

Graphic Method Illustrated By Charts Based on Years of Study

BY WM. E McHENRY*

IN CONNECTION with THE IRON TRADE REVIEW article of April 16, on "Decreased Rate of Pig Iron Production," the two accompanying charts may be of interest to its readers.

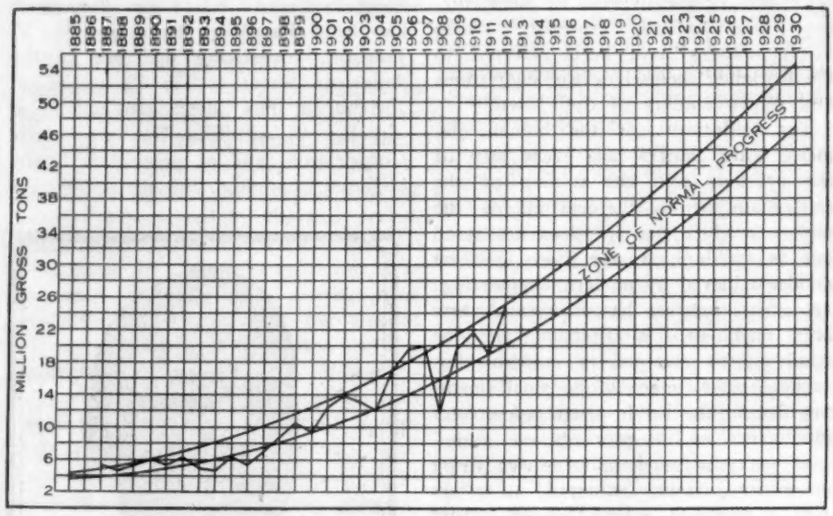
The "Rolled Iron and Steel" chart was the final outcome of a discussion (in 1909) as to whether the production for the years 1906 and 1907 was above or *within* what might be termed the normal production for those years.

What should this normal production be? was the question.

The actual production for a long term of years, plotted as on the chart, shows, through many fluctuations, a general upward sweep and a curve may be drawn through the high spots, corresponding to the calculations for Dr. Kent's forecast for pig iron. But to plot such a curve, using 1905, 1906 and 1907 as points, would be merely to admit that the production for those years *was* normal, instead of proving it. Such a curve, it is true, would confirm and continue the rate at which the iron business was said to double, viz., in a little less than ten years. But every plotting on this basis convinced me that this "doubling up" rule was bound to mislead.

Considering the factors which made the progress of the last 30 years possible; the development of the vast ore bodies on Lake Superior, the improvement in methods of transportation and manufacture and, by no means least, the ability of the country to finance this increase in plant and production (which was greatly facilitated by the formation of the Steel Corporation); it did not seem reasonable that *equivalent* factors would come into the problem in the next quarter century. Believing this, why base a forecast on the geometrical progression of the past?

Apart from this, the very *quantities* involved in any such doubling process in say 40 years, became unthinkable; four or five tons of *new iron* per year for every man, woman and child.



PRODUCTION OF ROLLED IRON AND STEEL

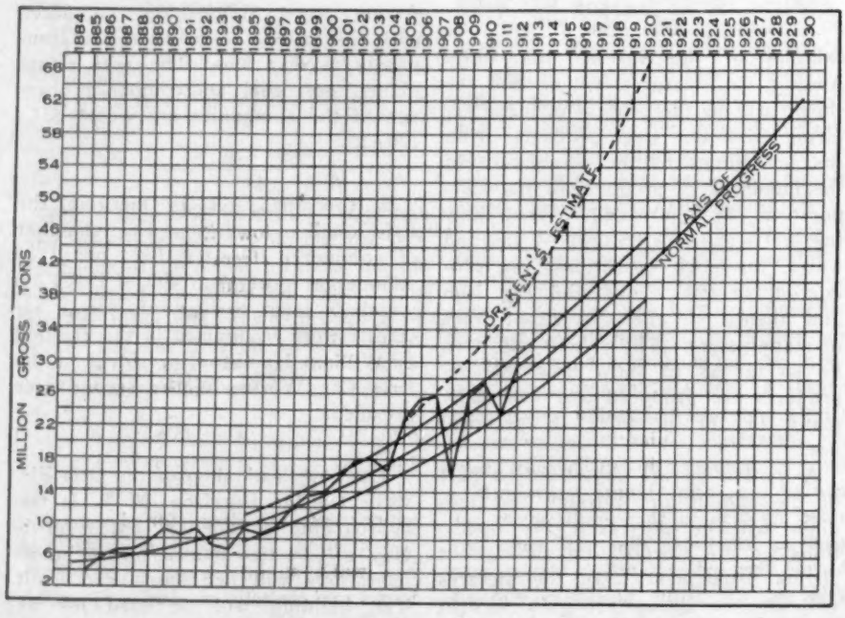
In attempting to solve the problem graphically, two things were evident.

First, the increase in production of a commodity over a period of years does not necessarily follow any mathematical or natural *law*; the possible capacity is always above the peaks and unused capacity is never made up.

Second, because of the foregoing and that the agricultural, financial and political factors vary so much, a *mean* curve will have so sinuous a character as to be of little help.

So I abandoned mathematics for common sense and considering the low spots significant, as well as the "peaks", experimented till I got a curve that would reasonably connect those years and periods which may be classed as normal.

The records for rolled iron and steel start with 1887 and the curve finally adopted touched the four million line at 1884. This curve follows a rate of progression about as follows: For the first five years, one million; for the next five years, two millions; for the third five years, three millions; and so on. So that, starting with four million tons as a base at 1884, we have for



PRODUCTION OF PIG IRON IN UNITED STATES

*Consulting cost accountant, 1420 Chestnut street, Philadelphia.—Auditor for 15 years Cambria Steel Co.

the five year points, 1889 plus one equals five millions; 1894 plus two equals seven millions; 1899 plus three equals ten millions; 1904 plus four equals 14 millions, and so on to 1914, 25,000,000 tons, which is about a million short of the actual production for 1913, but considerably in excess of the probable output for this year, which may turn out to be "sub-normal".

This curve, which cuts through the principal fluctuations during the period, might be called the *axis* of normal progress, as it is in fact of the actual progress for 26 years.

The so-called "zone of progress", shown on the chart, was the result of another experiment.

The wider disturbances of normal growth are chiefly caused by political factors and any plotting of the facts shows the tendency towards four or five year periods. A given point of growth, then, may be retarded or quickened depending upon its relation in time to these political cycles. This suggested a width of four years for the zone or two years on either side of the axis or median curve. Plotting the facts for the last four years on the chart made up as above added weight to the belief that the two years in question were abnormal.

It will be noted by referring to the chart that the "zone" includes all the fluctuations during the entire period, with the exception of those few years which (now) need no chart to show that they were out of the normal. The year 1913, for which the figures are not yet published, will fall within the zone, the increase over 1912 being about parallel to the curves. From present indications 1914 will be decidedly "sub-normal", in other words, below the lower curve bounding the zone.

The continuation of these curves for some years ahead should give us a fair idea of the growth we may reasonably expect as well as the *limits* of the ordinary fluctuations to which the industry is subject. This puts a rational forecast in graphic form and while worked out five years ago, has been rather strengthened by the later data.

Press of other matters prevented me from making a similar chart for pig iron production until receipt of your article of April 16, when I procured the figures from Mr. Gray, of The American Iron and Steel Institute, and made a study of them.

One of the first things noticed was that the totals for pig iron run just about 25 per cent above rolled iron and steel.

Accordingly a curve was plotted using five millions as a starting point at 1884 and a rate of progression on the same five year points, of 1,250,000, 2,500,000, 3,750,000, etc., etc. This seems rather arbitrary, but when the *facts* for the past 29 years are plotted on this chart, they are reasonably connected by the curve, as are the facts for rolled iron and steel on the former; while Dr. Kent's figures, plotted on the same chart and viewed by "hind sight", appear to be straying off into space.

It should be noted, however, that the purpose of Dr. Kent's forecast, as well as its basis, seems to have been the "records" or high spots; the aim being to give a measure of capacity rather than of normal production. It would be interesting to plot the total blast furnace capacity for each year along with the actual production; one record year may be 90 per cent of the total capacity while the previous "record", some years back, may have been but 80 per cent of the capacity of furnaces existing at that time.

The doubling up rate was true for a period. By taking one million tons as the *normal* rate for 1865 (which is about right) we may double every 10 years to date and come much nearer the facts than Dr. Kent, viz., 32,000,000 tons for 1915, instead of 47,000,000 tons. But it must be evident that the periods in which production will double will gradually lengthen. Iron and steel go so largely into capital expenditure that the phrase, "consumption of iron and steel", is inaccurate and "consumption per capita", worse.

Declare Strike

Westinghouse Employes Want Organization Recognized

Plants of the Westinghouse Electric & Mfg. Co., the Westinghouse Machine Co. and the Pittsburgh Meter Co., all controlled by the Westinghouse interests, were shut down practically, June 5, when several thousand employes went on a strike. It is roughly estimated from 7,000 to 10,000 employes, including men and women, took part in the "walkout". Strikers seek to obtain recognition of their union, and are endeavoring to have bonus, premium and piece work systems eliminated. Some of the strikers are identified, directly or indirectly, with the Allegheny Congenial Industrial Union, members of which were at the plant gates the morning of the walkout. There have been repeated attempts to organize men employed in the Westinghouse plants for many years. H. P. Davis, vice president of the Electric company, has given out a statement, in part, as follows:

"Officers of these companies (the Westinghouse Electric & Mfg., the Westinghouse Machine and the Pittsburgh Meter Co.) state that owing to the falling volume of business, which began to affect them last November, it was necessary to make reduction in working forces or in the working hours, and in order to give employment to as many as possible, the working hours were shortened from 54 to 45 hours a week.

"Since a large proportion of the workers are not in a position to realize how serious this falling off of orders has been, some dissatisfaction has arisen. The companies have even provided additional work for the men by making up a large stock of various classes of standard apparatus. * * * It is believed the majority of employes appreciated these efforts and for this reason it is not believed the present situation can be regarded as serious."

Union representatives have presented a petition presenting the following requests: That all grievances arising in Westinghouse plants be presented by a committee to authorized agents of the company affected; that grievances be carried to highest authorities in event authorized agents fail to make satisfactory adjustments and that present grievances be submitted for adjustment. The petition requests that: (a) The reinstatement of all men laid off and discharged since Feb. 1, 1914, in place of hiring new men; (b) the elimination of the bonus system; (c) the elimination of all premium systems; (d) the elimination of all piecework systems; (e) the arrangement during slack seasons for the alternating lay-off for a short period only and rotation of all employes whose temporary lay-off would not hamper or interfere in the proper operation of the plant.

The Williamsport, Pa., plant of the Sweets Steel Co., is installing machinery which will allow it to manufacture rails weighing from 12 to 60 pounds per yard rather than 12 to 40 pounds per yard as at present. Requirements have shown a tendency for some time toward heavier rails to stand the wear and tear of heavier rolling stock.

The Austin Organ Co., Hartford, Conn., is preparing to build a brick addition, 48 x 139 feet, three stories, which will be utilized for sheet metal construction and other purposes. A new water supply tower of 14,000 gallons capacity, will be placed upon this building for supplying the sprinkler system.

Obituaries

Edward A. Bryan, president of the Phoenix Equipment Co., maker of railroad equipment, died last week in Chicago.

James Thompson, looked upon as the oldest boilermaker in active service in Erie, Pa., having been employed in Erie shops more than 50 years, died last week at the age of 81 years.

Silas A. Barton, identified in his early days with the General Electric Co.'s plant at Lynn, Mass., and until a few months ago president of the American Watch Tool Co., Waltham, Mass., died at his home in Waltham a few days ago. He was born in Ware, Mass., Dec. 22, 1846, and was a veteran of the Civil war. He retired from the presidency of the American Watch Tool Co. when that business was sold recently.

Edward Brill, son of one of the three founders of the J. G. Brill Co., Philadelphia, manufacturer of street cars, died at his summer home at Vintnor, N. J., June 7, aged 64 years. Death was due to a complication of diseases. Mr. Brill entered the employ of the Brill company as a boy and at the time of his death had held every executive position, except that of president.

Elias Haiman, age 72, vice president of the Empire Plow Co., Cleveland, died in Berlin, Germany, recently. Mr. Haiman had been engaged in the manufacturing of plows for 50 years. After being a farmer during his youth, he began the manufacture of plows before the war, at Columbus, Ga. He moved to Atlanta, Ga., in 1875, continuing in the same business. He went to Cleveland 20 years ago and became connected with the Empire Plow Co. Mr. Haiman suffered from a stroke of appoplexy some months ago and was traveling with Mrs. Haiman in the hope of restoring his health when the end came rather unexpectedly.

John F. Budke, president of the Cannonsburg Steel & Iron Works, Cannonsburg, Pa., vice president and director of the Parkersburg Steel & Iron Co., Parkersburg, W. Va., and manager of the Cannonsburg Fuel & Light Co., died last week at his home in Cannonsburg. Mr. Budke was born in Wheeling, W. Va., Nov. 22, 1852. In 1885 he became manager of the Budke Mfg. Co., which sold out to the Cannonsburg Iron & Steel Co., of which he became general manager. In 1900 the Cannonsburg company sold out to the American Sheet & Tin Plate Co., and two years later Mr. Budke and associates organized the Parkersburg Iron & Steel Co., of which he was vice president and general manager for one year, when he organized the Cannonsbug Steel & Iron Works of which he had been president since. From 1900 to 1903 Mr. Budke sat in the Pennsylvania state senate. The first gas well in the Washington county, Pa., district was put down by Mr. Budke in 1905 on the site of the Cannonsburg Steel & Iron Works.

The Standard Seamless Tube Co., Pittsburgh, building a plant at Economy, Pa., has ordered five electric cranes from the Cleveland Crane & Engineering Co., Wickliff, O.

How to Figure Lake Ore Values

M. A. Hanna & Co. have issued a supplement to their annual ore book giving tables for figuring premiums and penalties on Lake Superior iron ore based on prices recently announced for this year. The tables are:

Old Range Bessemer Ore.

Base price $3.75 at Lake Erie port.
Guarantee 55.00 per cent Iron Natural.
Guarantee 0.045 per cent Phosphorus Dry.

Iron Natural.	Per cent.	Unit value.	Lake Erie value.
61.00 per cent.....	60—61	.07909	$4.37
60.00 per cent.....	59—60	.12909	4.30
59.00 per cent.....	58—59	.11909	4.17
58.00 per cent.....	57—58	.10909	4.05
57.00 per cent.....	56—57	.09909	3.94
56.00 per cent.....	55—56	.08909	3.84
55.00 per cent.....	Base ore	.07909	3.75
54.00 per cent.....	54—55	.07909	3.67
53.00 per cent.....	53—54	.07909	3.59
52.00 per cent.....	52—53	.07909	3.51
51.00 per cent.....	51—52	.07909	3.43
50.00 per cent.....	50—51	.07909	3.35
49.00 per cent.....	49—50	.11863	3.23
	48—49	.15818	....
	Below 48	.16 per unit	

Mesaba Bessemer Ore.

Base price $3.50 at Lake Erie port.
Guarantee 55.00 per cent Iron Natural.
Guarantee 0.045 per cent Phosphorus Dry.

Iron Natural.	Per cent.	Unit value.	Lake Erie value.
58.00 per cent.....	57—58	.10455	$3.78
57.00 per cent.....	56—57	.09455	3.68
56.00 per cent.....	55—56	.08455	3.58
55.00 per cent.....	Base ore	.07455	3.50
54.00 per cent.....	54—55	.07455	3.43
53.00 per cent.....	53—54	.07455	3.35
52.00 per cent.....	52—53	.07455	3.28
51.00 per cent.....	51—52	.07455	3.20
50.00 per cent.....	50—51	.07455	3.13
49.00 per cent.....	49—50	.111825	3.02
48.00 per cent.....	48—49	.1491	2.87
	Below 48	.15 per unit	

Old Range Non-Bessemer Ore.

Base price $3.00 at Lake Erie port.
Guarantee 51.50 per cent Iron Natural.

Iron Natural.	Per cent.	Unit value.	Lake Erie value.
61.00 per cent.....	60—61	.0699	$3.66
60.00 per cent.....	59—60	.0699	3.59
59.00 per cent.....	58—59	.0699	3.52
58.00 per cent.....	57—58	.0699	3.45
57.00 per cent.....	56—57	.0699	3.38
56.00 per cent.....	55—56	.0699	3.31
55.00 per cent.....	54—55	.0699	3.24
54.00 per cent.....	53—54	.0699	3.17
53.00 per cent.....	52—53	.0699	3.10
52.00 per cent.....	51.50—52	.0699	3.03
51.50 per cent.....	Base ore	.....	3.00
51.00 per cent.....	51–51.50	.0699	2.97
50.00 per cent.....	50—51	.0699	2.90
49.00 per cent.....	49—50	.10485	2.79
48.00 per cent.....	48—49	.1398	2.65
	Below 48	.14 per unit	

Mesaba Non-Bessemer Ore.

Base price $2.85 at Lake Erie port.
Guarantee 51.50 per cent Iron Natural.

Iron Natural.	Per cent.	Unit value.	Lake Erie value.
57.00 per cent.....	56—57	.06699	$3.22
56.00 per cent.....	55—56	.06699	3.15
55.00 per cent.....	54—55	.06699	3.08
54.00 per cent.....	53—54	.06699	3.02
53.00 per cent.....	52—53	.06699	2.95
52.00 per cent.....	51.50—52	.06699	2.88
51.50 per cent.....	Base ore	.....	2.85
51.00 per cent.....	51–51.50	.06699	2.82
50.00 per cent.....	50—51	.06699	2.75
49.00 per cent.....	49—50	.100485	2.65
48.00 per cent.....	48—49	.13398	2.52
	Below 48	.14 per unit	

PHOSPHORUS TABLE.

Percentage of phosphorus.	Rate of progression.	Phosphorus values.
0.060	0.0150	0.1725
0.059	0.0145	0.1575
0.058	0.0140	0.1430
0.057	0.0135	0.1290
0.056	0.0130	0.1155
0.055	0.0125	0.1025
0.054	0.0120	0.0900
0.053	0.0115	0.0780
0.052	0.0110	0.0665
0.051	0.0105	0.0555
0.050	0.0100	0.0450
0.049	0.0095	0.0350
0.048	0.0090	0.0255
0.047	0.0085	0.0165
0.046	0.0080	0.0080
0.045	0.0000	0.0000
0.044	0.0080	0.0080
0.043	0.0085	0.0165
0.042	0.0090	0.0255
0.041	0.0095	0.0350
0.040	0.0100	0.0450
0.039	0.0105	0.0555
0.038	0.0110	0.0665
0.037	0.0115	0.0780
0.036	0.0120	0.0900
0.035	0.0125	0.1025
0.034	0.0130	0.1155
0.033	0.0135	0.1290
0.032	0.0140	0.1430
0.031	0.0145	0.1575
0.030	0.0150	0.1725
0.029	0.0155	0.1880
0.028	0.0160	0.2040
0.027	0.0165	0.2205
0.026	0.0170	0.2375
0.025	0.0175	0.2550
0.024	0.0180	0.2730
0.023	0.0185	0.2915
0.022	0.0190	0.3105
0.021	0.0195	0.3300
0.020	0.0200	0.3500
0.019	0.0205	0.3705
0.018	0.0210	0.3915
0.017	0.0215	0.4130
0.016	0.0220	0.4350
0.015	0.0225	0.4575
0.014	0.0230	0.4805
0.013	0.0235	0.5040
0.012	0.0240	0.5280
0.011	0.0245	0.5525
0.010	0.0250	0.5775
0.009	0.0255	0.6030
0.008	0.0260	0.6290
0.007	0.0265	0.6555
0.006	0.0270	0.6825
0.005	0.0275	0.7100

Quarrying Ore in Distant Chile

First Intimate Account of South American Holdings of Bethlehem Steel Co.— Nature of Deposit, Dock Facilities and Plans for Carrying Ore on 4,500-Mile Journey

A FEW days ago the steamer Epsom docked at Philadelphia with the first cargo of Chilean iron ore to reach this country. The actual importation of this ore, calls more definite attention to the work being done by the Bethlehem Steel Co., South Bethlehem, Pa., in developing its large holdings at Tofo, Coquimbo, Chile. These mines will serve as the principal base of supply for the large Bethlehem blast furnace group. Present plans call for an ultimate production of 1,500,000 tons of ore annually, which must be carried 4,500 miles over the Panama Canal route to reach the furnace yards. In addition to these mines, two other notable American developments now are in progress in Chile, namely the Braden Copper Mines and the Chuquicamata Mines of the Chile Copper Co., both Guggenheim enterprises. The location of all of these projects is given on the map of Chile, Fig. 8.

The Bethlehem Steel Co.'s Tofo mines have been known for some years, attention having been drawn to them by Charles Vattier as early as 1888. About 1905, Mr. Vattier after securing options on the entire group of mines, transferred them to a French company—the Sociedad Altos Hornos de Corral. This company planned to use the ores in its blast furnace at Corral in Southern Chile. The mines were leased from the French company by the Bethlehem Steel Co. in 1912.

The mines are located about four miles from the coast near a small bay called Cruz Grande. This bay is situated near the Bay of Totorallillo, which at one time was of importance commercially owing to the location of a copper smelter there. This smelter depended for its ores upon La Higuera. This territory formerly was an important copper mining district and is located about four miles southeast of the Bethlehem Steel Co.'s Tofo property. Some of the La Higuera mines still are active.

The Tofo iron ore deposit is found on the crests of two hills, which are separated by a slight depression, or saddle. The general features are shown in Fig. 2, which is taken from the land side in the direction of La Higuera. The approximate lower limit of the solid ore is shown by the dotted line, everything above being solid iron ore of high quality. The analysis from over 200 samples taken from above this line, have averaged:

	Per cent
Iron	68.00
Manganese	.20
Sulphur	.015
Phosphorus	.057
Silica	1.50

This is a higher grade ore than any mined in the United States at present, and is richer even than the Swedish ore which has been shipped into the United States at the rate of nearly half a million tons annually for the past four or five years. Ore as rich is not existent in the United States in any quantity, unless it may be found in some of the California and Utah deposits, which are very similar geologically and chemically to the Tofo ores.

At the time of the first examination of the property by the Bethlehem Steel Co.'s engineers, in 1912, practically no prospecting had been done. Some doubt existed as to the actual occurrence, since there was nothing to prove absolutely that the deposit was not a superficial "skin" of ore over a rock core. Reasoning from other occurrences, it was considered safe to assume a certain depth, proportional to the superficial extent, which could be closely determined, as there is no vegetation. Subsequent exploration has shown that this assumption is well founded, and that there is considerably more ore than was computed at the time of the first examination.

FIG. 1—CRUZ GRANDE BAY, SHOWING ORE BRIDGE AND STOCK PILE AT TRAMWAY TERMINAL

Two Ore Bodies

In a general way there are two ore bodies very nearly connected in the saddle between the two hills. The deposit in the south hill has a diameter of about 1,000 feet, or, roughly, an

FIG. 2—TOFO HILLS, LINE SHOWING EXTENT OF DEPOSIT

area of 18 acres. The top of this hill, is 785 meters above sea level, and at present ore is known to occur at an elevation of 620 meters, so that the known vertical height of ore is 165 meters, or 550 feet. The deposit in the north hill is somewhat similar. It has not shown as great a vertical height of ore, but with the loose or float ore, with which it is surrounded, it is believed it will produce at least one-half as much ore as the south hill.

The general character of the deposit is shown in Figs. 2, 3 and 6. The float ore, which is especially abundant on the east side of the deposit, is shown in Fig. 7.

Instead of a mine, the Bethlehem Steel Co.'s Tofo property is essentially an iron ore quarry. Conditions are ideal for cheap open-cut mining, and the ore, though hard and dense, will be quarried by steam shovels after it is broken up by blasting. There is no overburden, and it will be a number of years before the deposit is worked sufficiently low to make the removal of any of the adjacent rock necessary.

As the height of the main deposit is about 2,300 feet above sea-level, the French company constructed an aerial cableway to convey to the coast the limited amount of ore it required. In the fall of 1912, this company reconstructed this tramway to give a nominal capacity of 800 tons per day, and also reconstructed a cantilever bridge at the bay. The stock pile and loading bridge are shown in Figs. 1 and 5.

A number of cargoes have been loaded satisfactorily from this bridge, although the loading is slower than American practice. An improvement in the way of substituting a rubber belt, instead of the buckets now used, shortly will be made by the Bethlehem Steel Co. Meanwhile, the construction of a steel dock, of the type commonly in use on Lake Superior, will be undertaken, and an electric railroad will be built which will haul the crushed ore from Tofo to Cruz Grande.

Unusual Geological Formation

Geologically, the Tofo deposit has no parallel in the eastern United States, or Lake Superior region. It does not exist in lenticular pods in gneissoid rocks, as in the case of the New Jersey and New York magnetites, nor as the regular bedded ores of Alabama. The Lake Superior ores are concentrations from a sedimentary "iron formation." The Chilean deposit is probably of the "contact" type of deposit, similar to many of these in the western part of the United States. The deposit at Iron Springs, Utah, has many points of similarity.

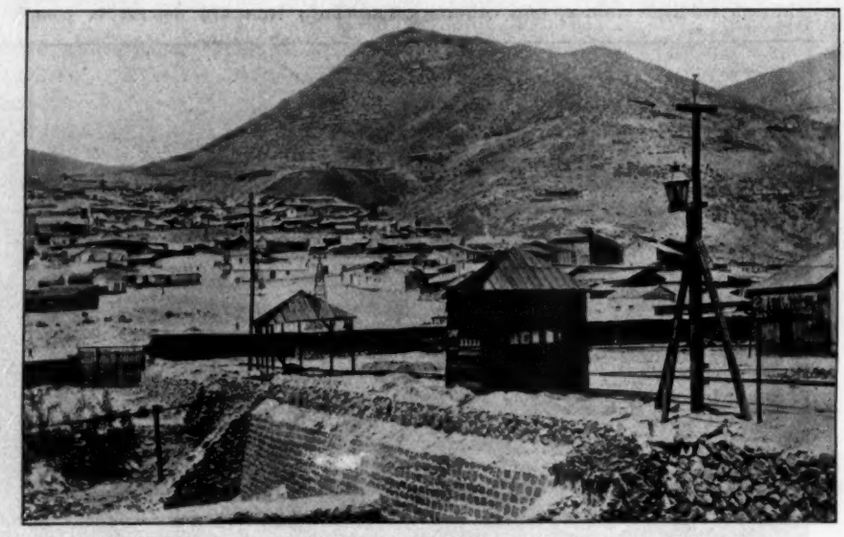


FIG. 4—LA HIGUERA, A MINING TOWN FOUR MILES FROM TOFO

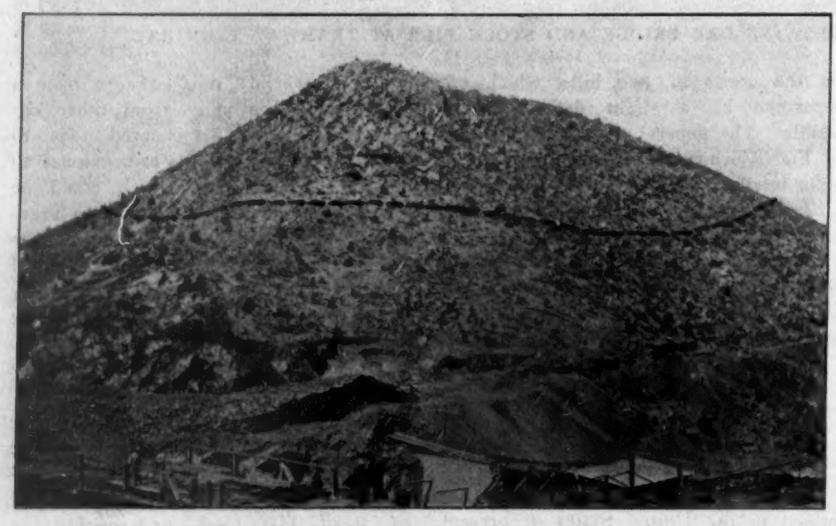


FIG. 3—DOTTED LINE SHOWS DEPTH OF SOLID IRON ORE

At Tofo the ore-bearing rock is an andesite, which, after its intrusion, deposited the ore which it had contained "in solution" while the rock was in a molten state. Upon cooling, the ore, mainly in the form of magnetite, was isolated instead of remaining disseminated, forming simply a ferruginous rock. This isolation apparently was caused by the other components of the molten magma being used up to a certain extent in forming new associations with the "contact rocks."

The Tofo ore seems to be a mixture

of magnetite and hematite. Some samples are intensely hard and dense, and exceedingly magnetic, while a nearby sample may be typical hematite, with entire absence of magnetism. The chemical differences chiefly are concerned with the phosphorus content. In this respect there are three grades of ore:

Non-Bessemer, with phosphorus content above .068.

Bessemer, with phosphorus content between .020 and .068.

Low Phosphorus, with phosphorus below .020.

Fortunately, these grades occur separately, and can be mined individually without difficulty. The tonnage of each grade is about the same.

In order to provide for the transportation of this ore, long-term freighting contracts have been entered into with Swedish and Norwegian owners, which

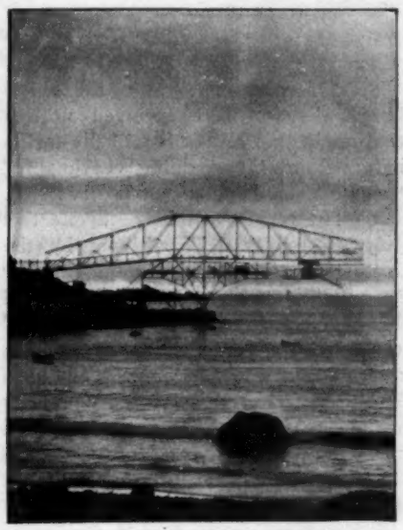


FIG. 5—ORE BRIDGE IN BAY

provide for the construction of a fleet of 17,000-ton steamers, especially designed for the ore trade by the Bethlehem company's naval architects. These vessels will be approximately 520 feet in length, and 65 feet beam. They will be capable of transporting approximately 15,000 tons of ore, being designed along lines adapted to prompt loading and discharging. In order to insure a regular supply of this ore at the furnaces at South Bethlehem, these vessels will return to Chile in ballast. For this purpose extra large water ballast compartments have been provided to insure necessary buoyancy. It is calculated that by returning to the loading port in ballast, each steamer will be able to deliver seven cargoes or 100,000 tons per year. These ore carriers will take a route to the United States by way of the Panama Canal, a distance of approximately 4,500 miles.

By the time the first of these large ore steamers is ready to load at Cruz Grande, which it is expected will be some time early in 1917, there will have been completed a new steel hopper pier at that port, which follows the general design of those now in operation on the Great Lakes. This pier will be capable of loading 15,000 tons of ore per day, and will have a storage capacity of from 30,000 to 35,000 tons, or, approximately, two full cargoes.

Prior to the completion of the new steel dock, the ore is being loaded into steamers under the present cantilever bridge, which is capable of loading at the rate of 2,000 tons per day. The substitution of the rubber belt conveyors for the buckets now used, will permit the loading of a 6,000-ton steamer in 12 hours.

To provide for the transportation of this ore prior to the completion of the pier and ore carriers, the Bethlehem company has entered into freighting contracts with European owners for the carriage of approximately 750,000 tons during the next two years. Prior to the opening of the Panama Canal all ore will proceed by way of the Magellan Straits and the steamship Epsom, the first steamer to deliver Chilean ore in the United States, arrived at Philadelphia this week, after having completed a voyage of 8,600 miles.

FIG. 6—VIEW AT TOP OF SOUTH HILL, SHOWING JOINTING IN THE ORE

The climate and general features of that part of Chile where the Tofo mines are located are misunderstood very generally by Americans. They think of Chile as a tropical and unhealthy country. In fact, though, Chile has as many climates as the United States, its north and south extent being from 18 to 56 degrees south latitude, or over 2,500 miles. If the southern end of Chile were placed over the southern end of Florida, the northern end would reach to Southampton Island on the north side of Hudson Bay, and in the latitude of Iceland. Climate also depends on altitude, and Chile has elevations varying from sea-level to 18,000 feet.

In the immediate vicinity of Tofo,

FIG. 7—STABLE BUILT OF FLOAT IRON ORE AVERAGING 65 PER CENT

weather conditions are ideal, except that the rainfall is light. Tofo is located between the arid belt, which reaches from Coquimbo to Peru, and the semi-arid belt, extending from Coquimbo a considerable distance southward. A rain at Tofo is of rare occurrence, but fogs are frequent, and help to supply the moisture that supports a very scanty vegetation of cactus and scrub brush. In the valleys, irrigation gives excellent results, and fruits and grains of all kinds are produced. A weather record for the month of January, 1914, shows the temperature ranges from 60 to 80 degrees Fahr. January in Chile, is of course a summer month.

Character of the People

While negroes are found in Colombia and Peru, the entire population in Chile is either Spanish or Indian, or a mixture of the two, with a considerable number of English and Germans. Immigration from southern Europe has never taken place to any extent, and immigration from Spain has failed, due to the greater opportunities offered in the Argentine Republic. Chile and Argentina each enjoy a stability of government unknown to any other American republic, except the United States. The last revolution in Chile occurred in 1884, 30 years ago.

New York Harbor

Its Advantages for Iron and Steel Making

A pamphlet setting forth the advantages of New York harbor for the production of pig iron and steel and for the location of manufacturing plants allied with the iron and steel industry, has been prepared and issued by the industrial bureau of the Merchants' Association of New York. Emphasis is laid upon the fact that iron ores, both foreign and domestic, may be assembled at New York at a favorable cost, compared with other centers. It is pointed out that, with the completion of the New York state barge canal, and upon the assumption that a rate of 60 cents will prevail from Buffalo to New York, Lake Superior ores may be laid down at New York at a total transportation cost of $1.75 per ton, compared with $2.03, per ton at Pittsburgh, and $2.60 per ton in the Lehigh Valley. A particular source of advantage from an ore standpoint of New York harbor, it is stated, lies in its accessibility to Lake Champlain ore deposits, which are estimated to contain 250,000,000 tons of available ore. With the completion of the Champlain branch of the New York Barge Canal, a year or more hence, it is estimated that a rate of not more than 50 cents a ton from Port Henry to New York may be obtained. This would mean an ore transportation cost of $0.83, per ton of non Bessemer and $0.77, per ton for Bessemer pig iron, based upon a 60 per cent iron content in the Champlain non-Bessemer and 65 per cent in the Bessemer ores. The probable cost of Cuban, New Foundland and other foreign and local ores is given.

The pamphlet summarizes the advantages of a furnace location on New York Harbor from an ore standpoint, as follows:

"The New York location gives the producer direct access to five great ore deposits. From each of these ore fields iron ore can be placed in New York below the cost of delivering Lake Superior ores in Pittsburgh. The saving in the cost of obtaining the ore supplies in transportation costs alone runs from $0.51 to $3.11 per ton of pig iron. No other location in the United States can compare with New York in the variety of its obtainable ore supplies or in the costs of delivering the ores at the furnaces."

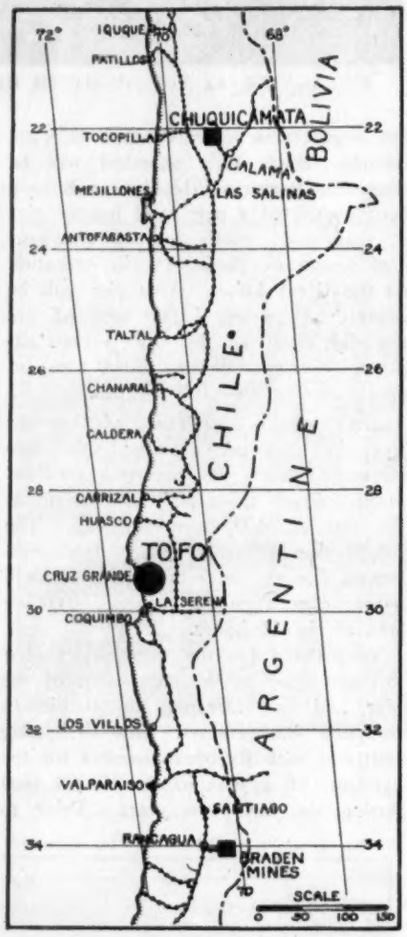


FIG. 8 — MAP SHOWING PRINCIPAL MINING DISTRICTS OF CHILE

It is estimated that by-product coke may be manufactured at New York at a cost of approximately $3.85 per ton of pig iron, compared with $2.97 per ton at Pittsburgh, the latter of which is based on Connellsville beehive coke. Ample limestone deposits, it is stated, easily are accessible to New York harbor.

As to the market for pig iron at nearby points along the Atlantic seaboard open to water transportaton from New York City, it is estimated that a consumption of practically 700,000 tons is represented, of which 200,000 tons is in the immediate vicinity of New York. The pamphlet also touches upon the advantages of New York harbor as a location for the production of steel, citing the low cost of iron and steel scrap at New York; the labor conditions; the importance of the local New York steel market and of the easy access to export market, and other factors of weight from the viewpoint of iron and steel manufacture.

Charge for Wasting

Blast furnace owners in the Pittsburgh district have received notices that trunk line railroads will file tariffs before June 15 providing charges for "wasting" or disposing of furnace slag. Proposed tariffs will become effective July 15, unless declared void by the Interstate Commerce Commission or the Public Service Commission of Pennsylvania. Railroads will ask 20 cents a ton for wasting clean slag and 35 cents a ton for excavations, brick-bats, etc. Some furnace owners estimate that proposed rates would net railroads about $2,000,000 annually, when furnaces are operating at capacity.

Will Complete Big Plant

The stockholders of the Southern Aluminum Co. have authorized the board of directors to issue bonds to a total amount of $7,000,000, the proceeds to be devoted in part to the completion of the company's plant at Whitney, N. C. This plant is to be completed in June, 1915, and the initial output will be 12,000,000 pounds of aluminum per year, this to be increased to 50,000,000 pounds per year.

Made Erection Engineer.—Richard Khuen, who has been division engineer of the American Bridge Co., at Pittsburgh, has been made general engineer of the erection department of the company, with headquarters at Pittsburgh. He succeeds the late Emil Gerber. L. H. Shoemaker, of the Pittsburgh district has been made division engineer to fill the vacancy caused by Mr. Khuen's promotion.

Will Erect Large Plant

At Josephine, Pa.—Plans of the Bollinger-Andrews Construction Co.

Some additional details are now available in regard to the contract made by the Bollinger-Andrews Construction Co. and Corrigan, McKinney & Co., as announced in THE IRON TRADE REVIEW last week. The contract entered into by the Josephine Furnace & Coke Co., a subsidiary of Corrigan, McKinney & Co., Cleveland, provides that the Josephine company will supply the Bollinger-Andrews Construction Co. hot and cold pig iron for 20 years and also provide a 20-acre site adjoining the blast furnace plant at Josephine, Pa. The Bollinger-Andrews company will erect a plant on the Josephine site, covering from six to eight acres. Metal supplied the Bollinger-Andrews company will be shipped at valley prices as quoted each month by THE IRON TRADE REVIEW. When the plant is operated at full capacity, from 350 to 400 tons of Bessemer pig iron will be required.

The proposed location of the Bollinger-Andrews plant will give owners an advantage of $1 a ton in freight on ingot molds shipped to Pennsylvania and eastern points. The rate on pig iron from Josephine to Pittsburgh is 75 cents a ton. The Bollinger-Andrews company, founded about 14 years ago, has established an enviable record as structural steel engineers and erectors, builders of ingot molds and mill castings.

The company already has completed plans for an extensive plant at Josephine, work on which will begin within the next 60 days. The works will be located a short distance from the blast furnace plant of Corrigan, McKinney & Co., and will enjoy good shipping facilities, having connections with the Pennsylvania and the Buffalo, Rochester & Pittsburgh railroads. Hot and cold metal will be carried from the blast furnace plant, over the Conemaugh & Blacklick railroad, owned by the Corrigan-McKinney company, and at least eight spurs will lead from the main line of the industrial road to the buildings of the Bollinger-Andrews company. The pattern shop, machine shop and green sand building, the metal storage yard, the ingot mold department and the direct metal mold buildings will be served by separate spurs.

Works Described

The plant will consist of one main and a half dozen smaller buildings. A pattern shop, 60 x 96 feet, and a pattern storage building, 60 x 120 feet, will form the eastern section of the new plant. The machine shop and green sand department will be housed in a building, 60 x 216 feet, commanded by two 20-ton cranes. A general supply room, a cupola, two core rooms and sand shed will be housed in a building 30 x 216 feet, with a 9-foot bay, 24 x 216 feet. Between this structure and the main building will be a metal storage yard 70 feet wide.

The largest building in the outlay, 110 x 408 feet, will contain the main casting and stripping floor, sand and supply sheds, two cupolas, smith shop and dry sand department. The building will be served by one 35-ton and two 20-ton cranes. The sand and supply sheds, the charging platforms and smith shop will be housed in a lean-to 30 feet wide, extending the entire length of the building. Core ovens will be located in a lean-to, 20 feet wide, extending the full length of the opposite side of the main building.

Will Treble Its Size

Direct metal molds will be manufactured in a building, 70 x 408 feet. The entire plant will be electrically driven; power plant equipment will be housed in a building 80 x 45 feet. The office building will be a short distance from the power plant building. Tentative plans have been drawn for the erection of several additional buildings in the future. All of the buildings will be of steel and concrete construction.

The new plant will almost treble in size the present works of the Bollinger-Andrews company, which employs about 400 men when operating at capacity. Proposed plans will enable the company to produce from between 100 and 120 molds a day. The company recently has developed a heat-consuming mold, patents on which have been granted. The mold is designed especially for the molding of ingots to be rolled into rails.

G. L. Bollinger is president; T. L. Andrews, vice president; J. N. Carey, secretary, and J. W. Fisher, treasurer of the Bollinger-Andrews company.

Service Recognized.—The Watson-Stillman Co., Aldene, N. J., has paid fitting recognition to the 50 years of service in its employ of Richard Ward Baker, by presenting to him a substantial check and extending to him a month's vacation. Mr. Baker began his apprenticeship in a small factory in Grand street, on June 2, 1864, and has been continuously identified with the Watson-Stillman Co., and its predecessor ever since. A special resolution was passed by the board of directors of The Watson-Stillman Co., expressing its high esteem of Mr. Baker's long and loyal service, and the resolution was presented to Mr. Baker in the presence of the employes, officers and directors of the company at its Aldene plant.

Koppers Ovens

Built and Under Contract in United States and Canada

Editor The Iron Trade Review:

In your issue of May 28 you published an article by William H. Blauvelt on "Recent Coke Oven Developments," and in connection with it he sets forth a list of by-product coke ovens of the various types which shows a larger number of ovens built by the Otto people than by Koppers, and almost as many built by Semet-Solvay as by Koppers, but the list does not show when they were built, nor does it show the number of ovens now under construction by H. Koppers Co., while it does show other types of ovens under construction; nor does it show how the ovens compare as to carbonizing capacity.

The Semet-Solvay and the Otto people were building ovens in the United States before Mr. Koppers began business in Germany in 1901, and Mr. Koppers did not build ovens in the United States until 1907. Since that time, Mr. Koppers and H. Koppers Co. have built and have contracted to build more than 65 per cent of all the by-product ovens in this country, and at the present time the number of Koppers ovens built and now in process of building is 2,287, and not 1,751 as shown by the published list.

The article does not fairly represent "Recent Coke Oven Developments."

We herewith hand you a list of Koppers ovens built and in process of building in this country and Canada since 1907.

H. Koppers Co.,
By J. C. McMath, V. P. and G. M.
Chicago, June 2, 1914.

KOPPERS BY-PRODUCT COKE OVENS IN THE UNITED STATES AND CANADA BUILT AND UNDER CONTRACT SINCE 1907.
June 1, 1914.

Plant.	No. of ovens.
Woodward Iron Co., Woodward, Ala...	170
Tenn. Coal, Iron & R. R. Co., Fairfield, Ala.	280
Illinois Steel Co., Joliet, Ill.	280
Indiana Steel Co., Gary, Ind.	560
Coal Products Mfg. Co., Joliet, Ill.	35
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ontario, Can.	110
Minnesota Steel Co., Duluth, Minn.	92
Maryland Steel Co., Sparrows Pt., Md.	126
Inland Steel Co., Indiana Harbor, Ind.	86
Republic Iron & Steel Co, Youngstown, Ohio	68
Laclede Gas Light Co., St. Lous, Mo..	56
Lehigh Coke Co., So. Bethlehem, Pa..	424
Total number of ovens.	2,287

TIPS FOR NEW BUSINESS

Equipment needs of the Iron and Steel works, Machine shops, Foundries and other Metal Working plants

In New York, the machinery market continues devoid of any business of importance, but there is a slightly better feeling, due to a somewhat better volume of inquiry. Most of the current inquiries involve only small requirements, but it is understood that there now are in the course of preparation several good-sized machine tool lists. No definite information is available as to when these will be submitted to the trade. The Hyatt Roller Bearing Co., of Harrison, N. J., has been a purchaser recently of a limited number of machine tools and another interest has closed for several large machines of a special nature. Demand for second-hand machinery continues fairly active. Demand from abroad for American machinery now is of smaller proportions than at any time since last fall.

In Pittsburgh, machine tool dealers say inquiry has come out in better volume the last couple of weeks, but new buying has not yet developed any snap. The Pennsylvania railroad, which submitted a list asking bids on a dozen and a half tools several weeks ago, has not yet closed for this equipment. Builders of heavy rolling mill equipment are not taking many new orders, but some of the larger plants are operating at capacity on old contracts.

In Cincinnati, a review of statements given by local machine companies concerning business done during May shows that that month was very disappointing. Foundries operated at about 50 per cent of their capacities and machine shops ran at about from 60 to 65 per cent. Many men laid off and a number of plants were forced to curtail production in order to avoid having a large surplus of stock on hand. Business today shows no improvement in the machine tool line. Second-hand machinery is a little better than new machinery.

EASTERN STATES

BINGHAMTON, N. Y.—The Canfield Gas Engine Co. has been incorporated with a capital of $50,000; by Louis and W. J. Newing, E. L. Whitlock.

BUFFALO, N. Y.—The Fisher Machine & Tool Co. has been incorporated with a capital of $15,000; by W. Carey, F. and E. Fisher.

SCHENECTADY, N. Y.—The Ramco Mfg. Co. has been incorporated with a capital of $100,000 to manufacture vending machines, patented devices, etc.; by A. Cramer, S. and S. A. Pearson, Cherry Valley.

SPRING VALLEY, N. Y.—Davitt Tool Co. has been incorporated; mining tools and machinery; $15,000; by E. W. Hofstatter, J. Furey and Michael Davitt.

ERIE, PA.—Contracts will be awarded this month for two modern fireproof public school buildings under plans of Consulting Architect William B. Ittner, of St. Louis. The cost will not be less than $250,000.

ERIE, PA.—Measurements just completed show that the General Electric Co. has more than one-half mile of buildings in operation at the East Erie Works. The new building under construction covers more than seven acres.

LEWISTOWN, PA.—The Stahler Machine Co. has been incorporated under the laws of Delaware to do a general foundry and machine shop business; $50,000; by M. A. Jones, Sr., Reedsville, Pa.; F. A. McCabe, G. R. Reynolds, W. R. Holman, Lewistown.

NEW CASTLE, PA.—The New Castle Steel & Iron Co. will increase its capital stock from $350,000 to $500,000; the additional sum to be used for equipping an electric welding plant etc. Offcers of the company are as follows: president, W. H. Schoen; secretary, H. E. Brainard; treasurer, Geo. G. Berger.

WILKESBARRE, PA. — County commissioners have approved plans for the 1,800-foot bridge across the Susquehanna river here; plans by D. A. Keefe, Athens, Pa.; estimated cost, $250,000. Bids will be asked when the state water commission has approved the plans.

BLOOMFIELD, N. J.—The Condensite Co. of America will erect a group of five buildings in Grove street, to cost $28,800. The company has a small plant in Glenn Ridge, which it will give up when the new buildings are completed.

KEARNY, N. J.—William J. Cullen is building a machine shop on Passaic avenue, near the Plank road.

NEWARK, N. J.—J. S. Munchy, 22 Prospect street, manufacturer of hoisting engines, contemplates building a plant 90 x 300 feet, to cost $50,000.

BALTIMORE.—Dietrich Bros., Pleasant and Davis streets, are building a machine shop, 30 x 300 feet.

EASTON, MD.—The Easton Electric Commission will receive sealed proposals until July 8, for the following items: 1, engines; 2, generators; 3, switchboard; 4, boilers; 5, stack; 6, feed water heater; 7, piping and pumps; 8, changes to building; 9, pole line; 10, street lighting equipment. The work is to be done in accordance with the plans of the engineer, the Reliance Engineering Co., which plans are now on file at the commission's offices in Easton, and at the Reliance company's office, Fourth National Bank building, Cincinnati.

WASHINGTON.—Major F. C. Boggs will receive bids until June 19 to furnish steel lockers, planished iron, bolts, nuts, kedge anchors, shovels, garbage cans, etc., as described in circular 855.

WASHINGTON.—T. J. Cowie will receive bids at the navy department until June 16 to furnish 800 pounds of standard track bolts and 2,000 standard railroad spikes, schedule 6836; delivery Portsmouth, N. H. For schedules apply to pay office, nearest navy yard.

CENTRAL STATES

ATHENS, O.—The city council, July 18 will decide upon the proposed issuance of $116,000 in bonds for a water works and light plant.

CINCINNATI. — The Williamson Heater Co. has secured the contract to install the heating apparatus to be used in the new Madisonville branch of the Cincinnati and Suburban Bell Telephone Co., Cincinnati. The building will cost about $25,000.

CINCINNATI.—Plans for a county high school to cost $40,000 and which will be built at Pikeville, Ky., are being prepared by Weber, Werner & Atkins, architects, of Cincinnati. Bids for all equipment will be received in the near future.

CINCINNATI. — The Dalton Adding Machine Co. has been incorporated with a capital stock of $5,000, to manufacture adding machines. The company has an office at 420 First National Bank building, that city, in charge of W. L. Gibson.

CINCINNATI.—An addition, which will be four stories and which will cost about $45,000, will be built by the Victor Auto Parts Co., adjoining its plant at Spring Grove and Dunham avenue. The new portion will be of brick and the dimensions will be 60 x 165 feet. Preliminary plans only have been prepared.

CLEVELAND.—The Telescopic Fender Co. has been incorporated with a capital of $50,000; automobile accessories; by C. L. Weisell, Arthur Sharp, R. E. Dickson, H. M. Dolan and C. D. Sabin.

CLEVELAND.—The Alday Mfg. Co. has been incorporated with a capital of $10,000 to make engines and motors; by H. A. Hauxhurst, M. T. Flanagan, F. X. Cull, Richard Inglis and V. Svancar.

CLEVELAND.—The Cleveland Die, Tool & Engineering Co., with $10,000 capital stock, has been incorporated by Andrew G. Anderson, Walter J. Iles, Samuel Pass, Ford A. Drake and E. A. Chamberlain, to manufacture dies, tools, jigs, etc.

CLEVELAND.—Bids will be received until noon June 19 at 513 the City Hall for construction, delivery and erection of stokers, for two 300-horsepower boilers for the Infirmary, Warrensville, O.; also for construction, delivery and erection of stokers for two 250-horsepower boilers for the city hospital and for lead covered cable for the municipal electric light plant.

CUMMINGSVILLE, O.—The Eagle Mfg. Co. has increased its capital stock from $50,-

Kreolite Floors

Kreolite Block Floor in Plant of Mather Spring Co., Toledo, Ohio. Building architects: Mills, Rhines, Bellman and Nordhoff

THE Mather Spring Co. has a splendid demand for a high-class product. They meet it over a Kreolite Block Floor.

THE ABOVE VIEW shows for itself the way in which Kreolite Block Floors resist the wear and tear of the average iron working shop. No repair gang in this shop.

TONS OF METAL are trucked over this floor on narrow wheeled trucks daily, while it is continually subjected to the cutting action of the sharp steel springs.

IN SPITE of this grinding wear note how smooth the floor remains. One man can truck more tons per day over it than two men could over many types of flooring.

RESISTING HARD WEAR and eliminating expense, permitting easy trucking hence reducing labor costs, being comfortable to work over thus increasing shop efficiency, are ways by which Kreolite Block Floors have proved their worth.

We have some interesting information regarding factory floors. It is yours for the asking. Drop us a card today

The Jennison-Wright Company

309 Huron Street **TOLEDO, OHIO**

000 to $100,000 in order to add a brass castings plant to its factory and increase its plating plant; total cost to be about $21,000.

MEDINA, O.—The Medina Foundry Co. has increased its capital from $75,000 to $150,000.

TOLEDO.—The Toledo Steel Tube Co. has been incorporated; $100,000; by H. W. McKisson, J. C. McKisson, S. A. Snell, G. L. Freeman, F. H. Ensign.

YOUNGSTOWN, O.—H. W. Jones, Cleveland, has been chosen to prepare preliminary plans for a municipal lighting plant here.

CHARLESTON, W. VA.—Consumers' Pipe Line Co. has been incorporated to build a pipe line for oil and gas; $100,000; by George W. McClintic, J. N. Carnes, R. G. Welsh, W. W. Williams and W. G. Matthews, all of this city.

HUNTINGTON, W. VA.—The National Interior Finish Co. will open bids June 20 on two horizontal tubular return boilers, 72-in. diameter, 18-foot length with 70 lap-welded 4-in tubes 18 feet long; quadrupled butt and strap style; to have 2 stacks, four flush front complete; in steel casings of 10-pound blue annealed sheet steel, Dutch oven type; f. o. b. cars Huntington.

MATOAKA, W. VA.—The Delparen Briquet Co. has been incorporated with a capital of $100,000 to operate briquetting plants; by J. A. Renahan, H. R. Mackay, A. H. Dary, E. O. Wagner and F. Leach, all of New York City.

LOUISVILLE, KY.—The Kentucky Wagon Mfg. Co. will enlarge and improve its plant. R. V. Board is president.

ELKHART, IND.—The Perkins Valve Co. has been incorporated with a capital of $50,000 to manufacture plumbing supplies; by Joseph G. Perkins, Frank E. Bortel, South Bend, and Richard Turnock, Elkhart.

ELKHART, IND.—The Elkhart Computing Scale Co. has been organized with a capital of $10,000 to manufacture scales; by Charles B. Bodrick, Jacob R. Winner, J. Bodrick and others.

HUNTINGTON, IND.—The Majestic Furnace & Foundry Co. proposes increasing its plant capacity one-third by adding a story to its machine room and enlarging its furnace room. It is changing its name to the Majestic Co.

INDIANAPOLIS.—The Comet Cyclecar Co. has been incorporated with a capital stock of $10,000 to manufacture automobiles; by Fred P. Mertz, L. F. Mertz and W. H. Osborn.

VALPARAISO, IND.—The McGill Metal Co. has been incorporated with a capital stock of $100,000, to manufacture metals. Among the directors are James H. McGill, H. W. Harrold and L. M. Harrold.

VEVAY, IND.—The Cincinnati Indiana & Ohio River Railroad Construction Co. has been incorporated here to build a steam railroad between Cincinnati and Louisville via the Ohio river; capital stock, $25,000.

AURORA, ILL.—Bids will be received until 2 p. m., June 20 by the town clerk for Montgomery bridge over Fox river. It will consist of four 65-foot reinforced concrete spans; estimated cost, $16,000. Information may be had from G. N. Lamb, Charles, Ill.

CHICAGO.—The Howard Seipp Brewing Co., 2513 Ingleside avenue, is planning a blacksmith and repair shop, to cost $20,000.

CHICAGO.—The American Car & Foundry Co., 2533 South Wood street, will build a one-story addition to its local plant; architects, Brown & Wilson.

CHICAGO.—American Magnesia Products Co. has been incorporated, $15,000; by Frank Bagley, Clarence J. Silber and Arthur A. Sherrard, 266 North Sacramento Boulevard.

CHICAGO.—Universal Steel Products Co. has been incorporated, $2,500; by Norman J. Tieman, Joseph D. McCord and Wilmer C. Bennett, 252 West Sixty-fifth street.

CHICAGO.—Fire at the plant of the International Car Co., Forty-second and Wood streets, June 1, practically destroyed the blacksmith and repair shops. Insurance of $125,500 was carried and the loss is total to that amount.

CHICAGO.—C. A. Eckstrom, 5 North La Salle street, is making plans and will take bids about June 20 for an auto service building for the Willys-Overland Motor Co; reinforced concrete, three stories, 106 x 300 feet, to cost about $300,000.

QUINCY, ILL.—The Rural Road Machinery Co. has been incorporated; $10,000; by A. Akers, Will J. Haintz and John L. Loebbing.

SPRINGFIELD, ILL.—Geo. H. Helmle, 804 Ferguson Building, is taking bids for an auto tire factory, brick and steel, one story, 200 x 300 feet, for the Wilson Tire & Rubber Co.

DETROIT. — Edmond Cline & Co., has been incorporated, $7,100; to manufacture sheet metal.

DETROIT.—Bohland Structural Steel Co. has been incorporated to erect steel buildings; $10,000; by L. W. Bohland and C. E. Duffy.

DETROIT. — Hermann Engineering Co. has been incorporated to manufacture gasoline engines, $25,000; by Alfred Gibbins and K. C. Herrmann.

PONTIAC, MICH. — Harris Bros., new owners of the Flanders Mfg. Co. are preparing to reopen the foundry. They are represented by D. C. McCord.

ASHLAND, WIS.—The Minneapolis, St. Paul & Sault Ste. Marie R. R. Co. has changed its plans for the construction of a new steel and concrete ore dock at Ashland and will now start to rebuild its present dock, installing modern electrical equipment, increasing the height to 80 feet and adding about 1,000 feet to the approach. The present structure will be used merely for substructure and form. The work will begin about Aug. 1 and be completed by the opening of navigation in 1915.

BAYFIELD, WIS.—Bay Iron Works has been incorporated; $15,000; by Henry C. Weaver, Luther E. Truax, T. A. Bruett, A. W. Macleod, Washburn, Wis.

BELOIT, WIS.—The board of directors of the Beloit Y. M. C. A. has accepted the bid of The Cunningham Co., Beloit, for the complete construction of the new "Y" building, at $76,450. The total appropriation, raised by popular subscription, is $100,000.

BELOIT, WIS.—The C. Mattison Machine Works, woodworking and sawmill machinery, turning machinery and belt grinders, is about to erect a large addition, 70 x 120 feet, of brick and steel construction, to be used for tool room, erecting floor, testing and shipping. The company recently started to build several new types of woodworking machines and built an addition last fall, but this has been found far too small for its purposes.

BERLIN, WIS.—The Metzig Bros. Co., wagon and sleigh builders, is equipping its shop for the production of automobile jacks. An output of 200 jacks per day is planned.

ELROY, WIS.—The board of education has appropriated $15,000 for the installation of new boilers, automatic regulating system and ventilating apparatus in the Elroy high school. J. C. Jacobsen is chairman.

EAU CLAIRE, WIS.—The North Side Auto Co., is building a machine shop addition, 28 x 59 feet, to its garage and is buying a small list of power-driven tools.

FOND DU LAC, WIS.—The Giddings & Lewis Mfg. Co., sawmill machinery and equipment, has appropriated $30,000 for the purchase of new machine tools and other power and manufacturing equipment. Purchases are being made direct. C. E. Cleveland is president and general manager and Henry Rueping is secretary and treasurer.

GRANTSBURG, WIS.—W. E. Hawley & Co., wholesale and retail hardware, have broken ground for a new store and warehouse, 60 x 100 feet, 3-story, to be equipped with electric elevators. Frank Larson, Pine City, Minn., is general contractor.

JANESVILLE, WIS.—At a special election it was voted that the city purchase the plant of the Janesville Water Co. and make it a municipal plant. The question carried with it a large bond issue, part of which is to be used for extensions and improvements. Plans will be made later.

MILWAUKEE, WIS.—The board of school directors, Frank M. Harbach, secretary, is about to receive bids for the construction of the superstructure of the new $250,000 Washington high school. Foundations were completed last fall. Plans are by Van Ryn & De Gelleke, architects, Milwaukee. The school will contain a complete manual training shop.

MILWAUKEE, WIS.—Hinz & Hinz, architects, are preparing plans for a new Home for Orphans for the Order of Sisters of Carmolite, at 25th avenue and South Pierce street. It will be of brick, steel and concrete, 150 x 300 feet in size, 4-story, with two wings 75 x 124 feet, 4 story. It will cost $300,000.

MILWAUKEE, WIS.—Louis G. Widule, county clerk, is preparing to call for bids for the construction of the new Milwaukee county house of correction group at North Milwaukee, plans by Architects Leenhouts & Guthrie having been given full approval by the state board of control. The construction work will cost $560,000 and the total appropriation is $750,000.

PORTAGE, WIS.—The Minneapolis, St. Paul & Sault Ste. Marie Ry. Co. is about to rebuild its roundhouse and division headquarters here, and build a steel overhead bridge at Endeavor, Wis.

PORT WASHINGTON, WIS.—The Turner Mfg. Co., gasoline engines, has recently established several foreign branches and agencies, the latest being at Perth West, Australia. The output is being increased each week and some small purchases of tools, milling machines, etc., are being made occasionally.

TWO RIVERS, WIS. — The Standard Aluminum Co., which recently installed a complete rolling mill plant, is now installing a large new annealing furnace.

KANSAS CITY, MO.—Fred H. Michaelis, 1113 McGee street, is making plans for a warehouse of stone and steel, three stories, 75 x 140 feet, to cost $85,000, for E. Shukeck, same address.

BURLINGTON, IA.—Bids will be received by the Citizens Water Co. until noon June 17 for laying a 30-in bell and spigot class "A" cast iron pipe and 15 flexible ball joints; Frank Lawlor, superintendent.

DES MOINES, IA.—The Gasoline Supply Co. plans erection of a three-story building, 40 x 60 feet, in this city, and additional tankage capacity of 100,000 gallons.

DES MOINES, IA. — The Des Moines Electric Co. may erect a high tension transmission line from this city to Oskaloosa, covering all intervening and surrounding towns; surveys now being made; estimated cost, $200,000. The company proposes to supply industrial and domestic power for the entire district.

MINNEAPOLIS.—Minneapolis Steel & Machinery Co. has the general contract for a grain elevator, steel construction, 100 x 105 x 49 feet, to cost $26,000, for the Pillsbury Flour Co.

MINNEAPOLIS.—James Leck & Co., 311 South Seventh street, has the general contract for a warehouse of reinforced concrete for Slocum Bergren Co., 125 North Third street, to cost $100,000.

SOUTHERN STATES

PUNTA GORDA, FLA.—Clerk will receive bids until June 30 to install a 30-kilo-volt-ampere, 3-phase, 60-cycle, 2,300-volt belted type alternator with pulley, rails and rheostat; a 20-kilowatt, 115-volt, direct current exciter with pulley, rails and rheostat; Blue Vernon switchboard and all necessary auxiliaries.

NEW ORLEANS, LA.—Bids will be taken until July 30 on wire and cables for the drainage system according to contract 64-D; Geo. G. Earl, general superintendent.

DALLAS, TEX.—T. D. Thomason, president of the Pyramid Egg Farm will open bids Sept. 1 for a gasoline engine.

CLARENDON, ARK.—Bids will be received until June 24 to construct water works as follows: Furnishing and laying 32,750 feet of 4 to 10-inch cast iron pipe, class C; 73 4-inch hydrants; 51 4 to 10-inch valves; brick and concrete pumping station; 500-gallons-per minute underwriters' steam pump; 250-gallons-per-minute duplex steam pump; two 100-horsepower boilers and accessories; building intake and laying 12-inch suction pipe to river; 100,000-gallon tank and tower, 100 feet high. The sewerage system includes 70 manholes, 17 flush tanks, sewage pumping pump, pumps and engines; specifications may be had at the office of secretary and Winters & Dove, engineers, Fort Smith, Ark.

JONESBORO, ARK.—The State Agricultural College which is making plans to rebuild its electric plant recently wrecked by fire, will order two tubular bricked-in boilers (one 125-horsepower and one 120-horsepower); one 30-kilowatt, 110 220-volt direct current generator and engine or turbine directly connected; switchboard equipment to be purchased later; V. C. Kays, of Jonesboro, engineer in charge.

LITTLE ROCK, ARK.—Southern Foundry & Machine Co. has been incorporated; $20,000; by H. C. Siratt, president; E. A. Backus, E. L. Williams, Chas. C. Byrne, O. Harrison and John C. Fuller.

NASHVILLE.—The Nashville Gallatin Interurban Railway Co. plans extension of its line to Springfield from Edgefield Junction via Goodlettsville, Ridgetop and Greenbrier, H. H. Mayberry is president.

WESTERN STATES

OLYMPIA, WASH.—The Newaukum railroad has been incorporated to build a railroad to connect the O. W. R. & N. railroad line with a mill plant 18 miles north of Napavine; estimated cost, $200,000.

ORTING, WASH.—The Orting Canning Co. will remodel its plant and install new machinery.

SEATTLE, WASH.—City will hold a bond issue election June 30 to obtain funds for building a bridge over the Duwamish waterway; estimated cost, $435,000.

CANADA

CLANBROOK, B. C.—Council is working to raise $110,000 for water system improvements including replacing the present pipe with steel pipe.

VANCOUVER, B. C.—The B. C. Electric Co. has applied for a permit to erect its proposed $275,000 car barn.

VANCOUVER, B. C.—H. W. Windle of the B. C. Steel Works Ltd., has made a proposition to the city council for building a plant to reroll scrap steel into marketable product.

SHERBROOKE, QUE. — The Rugg-Ball Mfg. Co., maker of hay rakes and shovels, will establish a branch factory at Ayer's Cliff, Que.

SHERBROOKE, QUE. — The Sherbrooke Machine Co. will erect a machine shop costing about $25,000; H. G. James, Whiting block, Sherbrooke, architect.

TRADE NOTES

DAYTON, O. — The annual meeting of stockholders and directors of the Barney & Smith Car Co., which was to have been held on June 2, was postponed because the plant is still in receivers' hands. The meeting is expected to be held in the near future, at which time an attempt will be made to reorganize the company and lift the receivership.

ERIE, PA.—The capital stock of the Skinner Engine Co., of Erie has been increased from $200,000 to $500,000.

MENOMONIE, WIS.—The plant and business of the Oscillating Sleigh Co. at Menomonie, Wis., has been purchased by C. G. Crocker, style of Menomonie Sleigh & Wagon Co. The plant will be enlarged and new equipment added at once.

SAN JUAN, PORTO RICO.—Bids will be received until 2 p. m. July 10 by light house inspector for furnishing metal work of five steel towers, delivered f. o. b. light house depot wharf, this city.

New Trade Publications

PICKLING MACHINES. — In an eight page bulletin recently issued, the Mesta Machine Co., Pittsburgh, describes and illustrates its line of pickling machines specially designed for installation on sheet mills. In addition to handling sheets, the machines may be used for pickling work of any character. The Mesta pickling machine brings mechanical action into play to such an extent that the material is said to be pickled with about one-half the acid and labor required for hand pickling.

AIR HOISTS.—A 20-page catalog recently issued by the Whiting Foundry Equipment Co., Harvey, Ill., is devoted to its line of air hoists adapted for use in foundries for rolling-over and closing molds and for other miscellaneous work for which a hoist of this kind may be used. Both vertical and horizontal hoists are illustrated and described and numerous views are included, showing the method of handling air hoists in foundries and other industrial establishments.

BUBBLING FOUNTAINS.—A handsomely illustrated, 70-page catalog issued by the Rundle-Spence Mfg. Co., Milwaukee, illustrates and describes various types of sanitary drinking fountains for installation in industrial plants, public buildings, offices, parks, etc. With the advent of the summer months the installation of these fountains in industrial plants usually is given more careful consideration than at any other time of the year and the various types shown meet every requirement of manufacturing establishments, as well as the specifications of various boards of health.

VALVES, PIPE FITTINGS, ETC.—The Kelly & Jones Co., Greensburg, Pa., has recently issued its 1914 catalog, describing a full line of brass and iron goods and specialties for conveying and controlling steam, gas, water, air and oil. The catalog proper contains 414 pages. A very complete alphabetical index constitutes one of the most valuable features of the book and this is supplemented by a condensed classification table which is printed on the outside back cover. The catalog contains descriptions, specifications, prices and illustrations of all kinds of valves, pipe fittings, gaskets, steam traps, lubricators, expansion joints, etc.

PNEUMATIC DRILLS.—Several new bulletins issued by the mining department of the Chicago Pneumatic Tool Co., Chicago, Ill., describe various new types of pneumatic drills. Bulletin No. 172 describes a plug and feather drill. Bulletin No. 153 covers a sinker used for drilling holes from 6 to 10 feet deep in stone, ore or coal. Bulletin No. 154 describes a pneumatic stoper designed to drill vertically upward and arranged for one man control. Bulletin No. 152 covers a new machine called a gatling drill which strikes from 600 to 750 blows per minute. It is claimed that each blow is absolutely uncushioned and the drill can be easily handled by one man, its weight being only 145 pounds.

OIL SWITCHES.—Leaflet No. 3745 issued by the Westinghouse Electric & Mfg. Co., Pittsburgh, describes and illustrates the construction of oil switches which are intended for use on direct or alternating currents series lighting circuits for controlling inductive loads of small capacity. The Westinghouse Electric & Mfg. Co. has also recently issued a number of other bulletins and leaflets including the following: Leaflet No. 3512 describing starters for squirrel cage motors; Leaflet No. 2364 describing direct current Type K crane motors; Leaflet No. 4172 describing bell ringing transformers and Folder No. 4282, describing ceiling and column fans.

COUNTING MACHINES AND ELEVATING TRUCKS.—An exceedingly well-arranged and handsomely illustrated 36-page catalog has been issued by the National Scale Co., Chicopee Falls, Mass., which is devoted to its line of counting machines and elevating trucks. The counting and weighing machines are used for counting various classes of products and material in process of manufacture and can be used to advantage in shipping rooms, receiving departments, packing, stock and store rooms, etc., for piecework operations, inspection work, etc. The results are given in dozens or gross and the weight also is indicated. The elevating truck built by this company is mounted on four wheels, being hand-propelled, and can be used to advantage in practically all industrial operations.

CASTINGS.—A very attractive booklet has recently been issued by the Buffalo Foundry & Machine Co., Buffalo, N. Y., describing its facilities for making iron castings of all kinds. The booklet is very completely illustrated with half-tone plates and includes some unusually interesting shop views of molds and cores. The first several pages are devoted to a description of the company's facilities for making gun iron in air furnaces. The remaining pages are filled with illustrated descriptions of special large castings which have been made by this concern. The Buffalo Foundry & Machine Co. operates one of the largest jobbing foundries in the world. The plant of the company is equipped to make castings up to 200 tons in weight and the main foundry contains three cupolas with a combined melting capacity of 55 tons per hour.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery Through Third Quarter.)

Bessemer, valley	$14.00
Bessemer, Pittsburgh	14.90
Basic, Pittsburgh	13.90
Basic, eastern Pa.	14.00
Malleable, Pittsburgh	13.90 to 14.40
Malleable, Chicago	14.25
Malleable, Philadelphia	15.50 to 15.75
Malleable, Buffalo	13.00 to 13.50
No. 1X Philadelphia	15.00 to 15.25
No. 2 foundry, Pittsburgh	13.90 to 14.40
No. 2 foundry, Cleveland	14.25
No. 2 foundry, Ironton	13.50
No. 2 foundry, Chicago	14.25
No. 2X foundry, Philadelphia	14.75 to 15.00
No. 2X foundry, New York	14.65 to 14.75
No. 2X foundry, Buffalo	13.00 to 13.50
No. 2 plain, Philadelphia	14.50 to 14.75
No. 2 plain, New York	14.25 to 14.50
No. 2 plain, Buffalo	13.75
No. 2 southern, Birmingham	10.25 to 10.50
No. 2 southern, Cincinnati	13.75 to 14.25
No. 2 southern, Chicago	14.85 to 15.85
No. 2 southern, Philadelphia	14.75 to 15.00
No. 2 southern, Cleveland	14.85 to 15.35
No. 2 southern, New York	14.75 to 15.00
No. 2 southern, St. Louis	14.50 to 15.00
Virginia, 2X, Philadelphia	15.30 to 15.55
Virginia, 2X, Jersey City	15.60 to 15.85
Virginia 2X, New Eng., all rail	16.20 to 16.70
Gray forge (eastern Pa.)	13.75 to 14.00
Gray forge, Pittsburgh	13.65
Gray forge, Birmingham	9.25 to 9.75
Silveries, 8 per cent, Cleveland	17.55
Silveries, 5 per cent, Birmingham	12.50
Silveries, 5 per cent, Chicago	16.85
Silveries, 8 per cent furnace	15.75 to 16.00
Standard low phos., Phila.	21.00
Lebanon low phos., furnace	17.00 to 17.50
Low phos., Pittsburgh	21.65 to 21.90
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.75 to 16.50
Charcoal, Buffalo	16.00 to 17.00
Charcoal, Birmingham	25.00
Middlesbrough, No. 3, Phila., ex ship	15.00 to 15.25

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi, non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

Foreign Bess., 50 to 65 per cent	7 to 8c
Foreign non-Bess., 50 to 65 per ent.	7 to 8c

COKE

(At the ovens.)

Connellsville furnace	$1.75 to 1.85
Connellsville fur. contr	1.85 to 2.00
Connellsville foundry	2.35 to 2.60
Connellsville fdy., contr	2.40 to 2.65
Wise county furnace	1.90 to 2.10
Wise county foundry	2.25 to 2.75
Pocahontas furnace	1.90 to 2.05
Pocahontas foundry	2.25 to 2.40
New River, foundry	2.75 to 3.50
New River, furnace	2.20 to 2.35

FERRO-ALLOYS

Ferro-manganese, Baltimore	$38.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent, Pgh.	22.90
Ferro-sil., 11 to 12 per cent, Pgh.	21.90
Ferro-sil., 10 to 11 per cent, Pgh.	20.90
Ferro-sil., 9 to 10 per cent, Pgh.	19.90
Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Bess. billets, Pbgh. and Yn.	$20.00
Open-hearth bil., Pbgh. and Yn.	20.00
Open-hearth bil., Phila.	22.40 to 23.40
Bess. sheet bars, Pbgh. and Yn.	21.00
Op.-h'th sh. bars, Pbgh. & Yn.	21.00
Forging billets, Phila.	26.40 to 27.40
Forging billets, Pittsburgh	25.00
Wire rods, Pittsburgh	26.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Light rails, 8 lbs., Pbgh. or Chi.	1.40c
Lgt. rails, 12 lbs., Pbgh. or Chgo.	1.35c
Lgt. rails, 16 to 20 lb., Pbgh. or Chicago	1.30c
Lgt. rails, 25 to 45 lbs., Pbgh. or Chicago	1.25c
Relaying rails, standard, Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect. Pbgh., base	1.50c
Angle bars, st., sections, Chgo.	1.50c
Spikes, railroad, Pbgh	1.40c to 1.45c
Spikes, railroad, Chgo	1.55c
Track bolts, Pbgh	2.00c
Track bolts, Chgo	2.00c

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.12½c to 1.15c
Structural shapes, Chicago	1.28c to 1.33c
Structural shapes, Philadelphia	1.25c to 1.30c
Structural shapes, New York	1.26c to 1.31c
Structural shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.28c to 1.33c
Tank plates, Pittsburgh	1.10c to 1.15c
Tank plates, Philadelphia	1.25c to 1.30c
Tank plates, New York	1.26c to 1.31c
Bars, soft steel, Pittsburgh	1.12½c to 1.15c
Bars, soft steel, Chicago	1.28c to 1.33c
Bars, soft steel, Philadelphia	1.30c
Bars, soft steel, New York	1.31c
Hoops, carloads, Pittsburgh	1.25c

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Baltimore	14½ cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Minneapolis and St. Paul	32 cents
Denver	67½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, plates and shapes	80 cents

Hoops, less carloads, Pittsburgh	1.30c
Bands, Pittsburgh	1.15c
Shafting, carloads, Pbgh., disc.	65 to 66
Shaft'g less carl'ds, Pbgh., disc.	62 to 63
Bar iron, Chicago	1.10c to 1.12½c
Bar iron, Philadelphia	1.20c to 1.25c
Bar iron, New York	1.25c to 1.30c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.30c
Hard steel bars, Chicago	1.25c to 1.30c
Smooth finish'g mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.85c to 1.90c
No. 28, black, Chicago	1.98c to 2.03c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh.	2.75c to 2.85c
No. 28, galvanized, Chgo.	2.98c to 3.03c
No. 28, cor. galv., Pbgh.	3.00c to 3.10c
No. 28, painted cor., Pbgh.	2.10c to 2.20c
No. 10, blue annealed, Pbgh.	1.35c
No. 10, blue annealed, Phila.	1.55c to 1.60c
Tin plate, 100 lb., coke, base	$3.30 to 3.40

IRON AND STEEL PIPE

(Pittsburgh.)

	Black Butt-weld.	Galv. Butt-weld.
Steel, ⅜ to 3 inches	80	71½
Iron, ⅜ to 2½ inches	70	61
	Lap-weld.	
Steel, 2½ to 6 inches	79	70½

BOILER TUBES

Steel, 3½ to 4½ inches	72
Iron, 3½ to 4½ inches	60

WIRE PRODUCTS

Wire nails, jobbers, Pittsburgh	$1.50 to 1.55
Wire nails, retailers, Pittsburgh	1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.30 to 1.35
Plain wire, retailers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.70 to 1.75
Galvanized wire, retailers, Pbgh.	1.75 to 1.80
Polished staples, Pbgh.	1.50 to 1.55
Galvanized staples, Pbgh.	1.90 to 1.95
Barb wire, painted, jobbers, Pbgh.	1.50 to 1.55
Barb wire, painted, retail'rs, Pbgh.	1.55 to 1.60
Barb wire, galv., retailers, Pbgh.	1.95 to 2.00
Barb wire, galv., jobbers, Pbgh.	1.90 to 1.95

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 10; cut threads, 80 and 5; larger or longer, 75 and 10.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled, 80 and 15; cut, 80 and 10; larger or longer, 75 and 15.

Gimlet and cone point lag or coach screws, 80 and 20.

Hot pressed square, blank or tapped nuts, $6.80 off list; hot pressed hexagon blank or tapped, $7.20 off.

Cold pressed, C. & T. square, blank or tapped, $6 off; hexagon, blank or tapped, ⅜ inch and larger, $7.20; ⅛-inch and smaller, $7.80.

RIVETS

Structural rivets, Pbgh.	1.55c to 1.65c
Structural rivets, Chgo.	1.73c to 1.78c
Boler rivets, Pbgh.	1.65c to 1.75c
Boiler rivets, Chgo.	1.83c to 1.88c

SCREWS

(New York.)

Lag, gimlet and cone point	80 and 20
Coach, gimlet point	80
Standard jack	70 and 10
Mch., cut thread, flat head	50 and 10
Mach., cut thread, round head	50 and 10 and 10
Mch., cut thread, fillister hd.	40 and 40 and 10
Mch., rolled thread, flat head or round head	80 and 10
Set screws, iron	75 and 10 and 10
Set screws, steel, per cent advance over iron	25
Square head cap screws	70 and 10 and 10
Hexagon head cap screws	70 and 10 and 10
Fillister head cap screws	60 and 10 and 10
Flat head wood screws	10 and 10 and 5
Round head wood screws	10 and 10 and 5

WASHERS

(Discounts, Iron or Steel, to Jobbers, Cleveland.)

⅛-inch	$7.25
⅜-inch	7.00
½-inch	7.00
⅝-inch	7.00
¾-inch	7.00

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

TWISTED REINFORCING BARS

(Soft steel, Pittsburgh mill.)

¾-inch and larger	1.25c
⅝-inch	1.30c
½-inch	1.35c
⅜-inch	1.50c
¼-inch	1.75c

IRON AND STEEL PRICES

Corrected up to Tuesday noon

TACKS

(New York.)—

	Discount.
American carpet tacks.....	90 and 20 and 10
American cut tacks.....	90 and 20 and 10
Railroad tacks	90 and 40
Gimp tacks	90 and 20 and 10
Finishing nails	70

WIRE ROPE

Galvanized, iron and steel.....	47½ and 2½
Bright, Iron and steel.....	55 and 2½

TRIANGLE REINFORCING MESH

(Per 100 square feet f. o. b. mill, car loads.)

No. 4, plain	$1.00
No. 4, galvanized	1.12
No. 7, plain	.49
No. 7, galvanized.....	.55
No. 23, plain	1.69
No. 23, galvanized	1.88
No. 26, plain	1.17
No. 26, galvanized	1.30
No. 27, plain	.96
No. 27, galvanized	1.07
No. 31, plain	2.49
No. 31, galvanized	2.76
No. 35 plain	1.17c
No. 35 galvanized	1.30
No. 39, plain	3.05
No. 39, galvanized	3.38
No. 43, galvanized	1.23
No. 43, plain	1.10

SPIRAL RIVETED PIPE

(Per 100 linear feet, f. o. b. factory.)

4-inch, plain	$ 19.76
4-inch, galvanized	30.74
6-inch, plain	33.05
6-inch, galvanized	49.73
8-inch, plain	43.17
8-inch, galvanized	65.00
10-inch, plain	66.42
10-inch, galvanized	96.15
12-inch, plain	83.75
12-inch, galvanized	118.30
14-inch, plain	99.14
14-inch, galvanized	138.85
16-inch, plain	117.53
16-inch, galvanized	166.58
20-inch, plain	183.79
20-inch, galvanized	248.39
24-inch, plain	219.92
24-inch, galvanized	293.99
30-inch, plain	324.81
30-inch, galvanized	430.64

CAST IRON PIPE

Three to 24 in., Cleveland.....	$22.35 to 22.80
Four-inch, water, Chicago.....	26.50
Six to 12 inches, Chicago.....	24.50
Larger sizes, Chicago.....	24.00
Six inch, water, New York....	20.50 to 21.50
Four-inch, water, Birmingham..	21.50
Six-inch and larger, Birmingham.	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago.....	1.65c
Steel bars, Cleveland.....	1.80c
Steel bars, Cincinnati.....	1.70c to 1.85c
Steel bars, Philadelphia.....	1.65c to 1.70c
Steel bars, New York.....	1.80c
Iron bars, Chicago.....	1.65c
Iron bars, Cleveland.....	1.75c
Iron bars, Cincinnati.....	1.65c to 1.75c
Iron bars, Philadelphia.....	1.60c to 1.65c
Iron bars, New York.....	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago.....	1.75c
Shapes and plates, Cleveland....	1.90c
Shapes and plates, Cincinnati....	1.80c to 1.90c
Shapes and plates, Philadelphia..	1.65c to 1.70c
Shapes and plates, New York....	1.85c
No. 10 blue ann. sheets, Chgo...	1.95c
No. 10 blue ann. sheets, Cleve..	2.15c
No. 10 blue ann. sheets, Cinci..	1.95c to 2.05c
No. 28 black sheets, Chgo.....	2.45c
No. 28 black sheets, Cleveland..	2.60c
No. 28 black sheets, Cincinnati..	2.45c to 2.55c
No. 28 galv. sheets, Chgo.....	3.45c
No. 28 galv. sheets, Cleveland...	3.60c
No. 28 galv. sheets, Cincinnati...	3.45c to 3.55c

IRON AND STEEL SCRAP

(Net tons.)

No. 1 railroad wrought Chgo....$	8.75 to 9.00
No. 1 railroad wrought, Cleve...	9.50 to 10.00
No. 1 railroad wrought, St. L..	7.75 to 8.00
No. 1 railroad wrought, Cinci....	8.00 to 8.50
No. 2 railroad wrought, Chgo..	8.50 to 8.75
No. 2 railroad wrought, St. L....	7.50 to 7.75
Arch bars and transoms, Chgo...	12.00 to 12.50
Arch bars and transoms, St. L..	11.00 to 11.50
Knuckles, coup. and spr'gs, Chgo.	9.00 to 9.50
Knuckles, coup. and sp'gs, St. L.	9.00 to 9.25
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis.....	13.00 to 13.50
Steel car axles, Chgo.....	12.25 to 12.50
Steel car axles, St. Louis.....	11.50 to 11.75
Locomotive tires, Chicago.....	9.75 to 10.00
Locomotive tires, St. Louis.....	9.00 to 9.50
Cut forge Chicago.....	8.50 to 8.75
Pipes and flues, Chicago.....	6.50 to 7.00
Pipes and flues, Cleveland.....	8.00 to 8.50
Pipes and flues, St. Louis.....	6.50 to 7.00
No. 1 cast, Chicago.....	10.00 to 10.50
No. 1 cast, Cleveland.....	10.75 to 11.00

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis.....	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley furnaces	1.20
Cincinnati	2.00

No. 1 cast, Cincinnati.....$	9.25 to 9.75
No. 1 cast, St. Louis.....	10.00 to 10.50
No. 1 busheling, Chicago.....	7.25 to 7.75
No. 1 busheling, Cleveland.....	8.75 to 9.25
No. 1 busheling, Cincinnati.....	6.00 to 6.50
No. 1 busheling, St. Louis.....	7.50 to 8.00
No. 2 busheling, Chicago.....	5.75 to 6.25
No. 1 boiler plate, cut, Chgo...	6.50 to 7.00
No. 1 boiler plate, cut, Buffalo...	9.00 to 9.50
No. 1 boiler plate, cut, St. L....	6.00 to 6.50
Boiler punchings, Chicago.....	9.00 to 9.25
Cast borings, Chicago.....	4.75 to 5.25
Cast borings, Cleveland.....	6.00 to 6.50
Cast borings, Cincinnati.....	4.25 to 4.75
Cast borings, St. Louis.....	4.00 to 4.50
Machine shop turnings, Chgo...	5.25 to 5.50
Machine shop turnings, Cleve..	5.50 to 5.75
Machine shop turnings, Cinci...	4.50 to 5.00
Machine shop turnings, St. L....	4.50 to 5.00
Malleable, agricultural, Chgo....	8.25 to 8.75
Malleable, agricultural, St. Louis.	7.25 to 7.50
Malleable, railroad, Chicago.....	9.25 to 9.75
Malleable, railroad, Cincinnati..	6.50 to 7.00
Malleable, railroad St. Louis...	8.00 to 8.25
Angle bars, iron, Chgo.....	11.75 to 12.25
Angle bars, iron, St. Louis.....	10.00 to 10.50
Angle bars, steel, Chgo.....	8.25 to 8.75
Angle bars, steel, St. Louis.....	9.00 to 9.50
Stove plate, Chicago.....	9.25 to 9.75
Stove plate, Cleveland.....	8.25 to 8.75
Stove plate. Buffalo.....	9.75 to 10.00
Stove plate, Cincinnati.....	6.75 to 7.25
Stove plate, St. Louis.....	7.50 to 8.00
Bundled sheet, Cincinnati.....	4.75 to 5.25
Wrought iron pil'g plates, Clev..	13.00

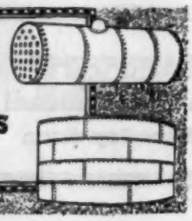
(Gross Tons.)

Heavy melting steel, Pbgh.....	$12.00
Heavy melting steel, Buffalo....	10.00 to 10.50
Heavy melting steel, Chicago...	9.75 to 10.00
Heavy melting steel, Cleveland.	10.50 to 11.00
Heavy melting steel, Cincinnati.	9.00 to 9.50
H'vy melting steel, eastern Pa.	10.50 to 11.00
Heavy melting steel, New York.	8.50 to 8.75
Heavy melting steel, St. Louis.	11.00 to 11.50
Bundled sheet, Buffalo.....	6.25 to 6.50
Grate bars, Buffalo.....	9.50 to 10.00
Grate bars, New York.....	5.75 to 6.00
No. 1 railroad wr'ght, east. Pa..	12.50 to 12.75
No. 1 railroad wrought, Pbgh...	11.00 to 11.50
No. 1 R. R. wght., New York.	10.25 to 10.50
No. 1 R. R. wrought, Buffalo...	11.00 to 11.50
Shafting, New York.....	12.00 to 12.50
Pipes and flues, New York.....	8.00 to 8.25
Pipes and flues, eastern Pa....	9.25 to 9.75
Mch. shop turnings, New York	5.75 to 6.00
Machine shop turnings, Buffalo..	5.50 to 6.00
Mch. shop turnings, Pbgh.....	7.75 to 8.00
Mch. shop turnings, eastern Pa.	7.50 to 8.00
Cast borings, New York.....	5.75 to 6.00
Cast borings, eastern Pa.....	8.00 to 8.50
Cast borings, Buffalo.....	6.00 to 6.50
Cast borings, Pittsburgh.....	7.75 to 8.00
Stove plate, (Jersey points)....	8.50 to 8.75
Stove plate, Pittsburgh.....	10.00 to 10.25
Stove plate, eastern Pa.....	8.50 to 9.00
Shoveling steel, Chicago.....	9.25 to 9.50
Shoveling steel, St. Louis.....	9.00 to 9.50
Reroll'g rails, 5 ft. & ov., Pbgh.	13.00 to 13.25
Reroll. rails, 5 ft. and ov., Chgo.	11.25 to 11.75
Reroll. rails, 5 ft. and ov., Cleve.	11.75 to 12.25
Reroll. rails, 5 ft. & ov., E. Pa.	12.25 to 12.75
Reroll. rails, 5 ft. and ov., St. L.	12.00 to 12.50
Steel rails, short, Chicago.....	10.50 to 10.75
Steel rails, short, Cleveland.....	13.00 to 13.50
Steel rails, short, eastern Pa....	11.00 to 11.25
Steel rails, short, St. Louis.....	11.50 to 12.00
Iron rails, Cleveland.....	13.50 to 14.00
Iron rails, Cincinnati.....	10.50 to 11.00
Iron rails, eastern Pa.....	15.00 to 16.00
Iron rails, St. Louis.....	12.00 to 12.25
Frogs, switches, guards, Chgo..	9.50 to 9.75
Frogs, switches and g'rds, St. L.	10.25 to 10.50
Car wheels, (iron), Pittsburgh..	12.00 to 12.50
Car wheels, (steel), Pittsburgh..	13.00 to 13.50
Car wheels, Chicago.....	11.25 to 11.50
Car wheels, eastern Pa.....	11.25 to 11.50
Car wheels, Buffalo.....	12.00 to 12.50
Car wheels, N. J. points.....	10.50 to 11.00
Car wheels, St. Louis.....	11.00 to 11.25
Iron axles, Pittsburgh.....	22.50 to 23.00
Iron axles, Cincinnati.....	19.00 to 20.00
Iron axles, eastern Pa.....	20.00 to 21.00
Iron axles, Buffalo.....	21.50 to 22.00
Iron axles, Chicago.....	19.00 to 19.50
Steel car axles, New York.....	12.25 to 12.75
Steel car axles, Buffalo.....	15.00 to 15.50
Steel car axles, Cleveland.....	14.00 to 16.00
Steel car axles, eastern Pa.....	14.00 to 14.50
No. 1 busheling, Buffalo.....	8.50 to 9.00
No. 1 busheling, Pittsburgh....	10.00 to 10.25
No. 2 busheling, Buffalo.....	6.00 to 6.50
Low phosphorus steel, Buffalo..	15.00 to 15.50
Low phosphorus steel, Pbgh....	14.00 to 14.25
Low phos. steel, eastern Pa.....	14.50 to 15.00
No. 1 forge, eastern Pa.....	8.50 to 9.00
No. 1 cast, eastern Pa.....	12.00 to 12.50
No. 1 cast, Pittsburgh.....	12.00 to 12.25
No. 1 heavy cast (N. J. points)	11.50 to 11.75
Boiler plate, Cleveland.....	8.50 to 9.00
Mall. iron, agricul., Cleveland...	9.00 to 9.50
Mall. iron R. R., Cleveland....	11.00 to 11.50
Malleable, railroad, Pittsburgh..	10.00 to 10.25
Malleable R. R. Buffalo.....	10.75 to 11.25
Mall., R. R. east. Pa.....	9.00 to 9.50
Bundled sheet, Pittsburgh.....	8.50 to 8.75
Bundled sheet, Cleveland.....	7.50 to 8.00

MISCELLANEOUS SHOP TOOLS

	Discount.
Standard files	80 and 5
Heavy hammers, 3 to 5 lb.....	80 and 10
Heavy hammers, over 5 lb.....	80 and 5
Gas pliers, 7-inch, per dozen.....	$2.00
Gas pliers, 12-inch, per dozen.....	3.50
Cold chisels, per pound.....	10c to 15c
Wrenches, Alligator, discount.....	75 and 80
Wrenches, drop forged S.....	50 and 10

STEEL PLATE CONSTRUCTION
Riveted and Welded Tanks
of every description
ACME BOILER WORKS, Canal Dover, O.



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Phoenix Iron Works Company
Meadville, Pa.
Founders, Machinists and Boiler Makers
Engines, Boilers, Castings Rough or Finished
Are prepared to figure on special work

PUBLISHED APRIL, 1914
STEEL FOUNDRY
By JOHN HOWE HALL
Consulting Engineer
271 pages, 6 x 9. Illustrated. $3.00, postpaid

THE author covers fully the *metallurgy and production of all classes of ordinary steel castings* in use in this country.

He aims to give:

(1) The characteristics of steel castings from a manufacturing point of view.

(2) The details of the various steel manufacturing processes and their characteristics as applied to the different types of castings, including relative cost of installation, relative cost and quality of steel produced, etc.

(3) Foundry procedure, such as moulding, pouring, annealing, etc.

The book will appeal alike to the metallurgist and the superintendent in charge of the foundry. It covers metallurgical processes, shop methods and costs of steel.

THE PENTON PUBLISHING CO.
PENTON BUILDING, CLEVELAND, OHIO

Book Review

(*Continued from page* 1045)

than coal, cheaply, and concludes, "if in the future we are able, as suggested by Lord Kelvin, to draw endless supplies of power from the ether itself, we can wait with quiet minds the exhaustion of the coal supplies of the world."

The arrangement of the book is excellent. A well-constructed index allows prompt reference to any portion and copious footnotes and references give authority and coherence to the several sections. The illustrations, for the most part drawings and diagrams, are more illuminating than photographs, even though not possessing the beauty of the halftone. Every step is illustrated and in addition chemical formulae of reactions and tables of various data are provided to give information wherever possible.

Aluminum From Clay

Though new bauxite deposits are being found from time to time, there is considerable interest in the preparation of pure alumina from clay or other silicate minerals. As soon as a process for the extraction of alumina from clay is put on a commercial basis, large quantities of low-grade bauxite containing considerable admixtures of clay will become available as aluminum producers. According to the United States Geological Survey, there is a large tonnage of such material associated with most of the southern Appalachian bauxite.

Output of Aluminum in 1913

The year 1913 was the most prosperous in the history of the bauxite and aluminum industries in the United States, according to W. C. Phalen, of the United States Geological Survey, in a report for that year. The production of bauxite in 1913 was 210,241 long tons, valued at $997,698, against 159,865 long tons, valued at $768,932, in 1912. Bauxite is used chiefly as raw material in the production of metallic aluminum, in the manufacture of aluminum salts, in the manufacture of bauxite bricks, and in the manufacture of alundum for use as an abrasive.

The amount of aluminum consumed in the United States in 1913 was 72,379,090 pounds, against 65,607,000 pounds in 1912. The marvelous growth of the aluminum industry is shown by a comparison of the 1913 output with the total consumption of aluminum during the last 20 years, 377,000,000 pounds. More than 329,000,000 pounds have been consumed in the last 10 years. The total production in 1884 was only 150 pounds.

Aside from its use in the manufacture of cooking utensils, aluminum is now being employed on a larger scale in the construction of welded tanks, cooking vats, and vessels used by brewers, preserve manufacturers, and fat recoverers, and in industries where a metal is required that will conduct heat, will not corrode, and is not poisonous. It has been found by experiments that the only substances which dissolve any of the metal are oranges, lemons, Brussels sprouts, and tomatoes, and that in every test the quantity dissolved was so small as to be harmless.

The use of aluminum wire as a conductor in long-distance power-transmission schemes is increasing. A recently developed branch of the aluminum industry is the manufacture of the powdered metal known as aluminum-bronze powder, which is used extensively as a paint pigment, in explosives, in lithographing, and in printing. Aluminum foil has partly displaced tinfoil for wrapping articles such as cheese, chocolate candies, and tobacco.

One of the newest and perhaps oddest uses for aluminum is its employment in making the soles of shoes to be used by workmen employed in wet and damp places. The aluminum-soled shoe lasts much longer than an ordinary shoe and is said to be impervious to dampness.

A copy of the report may be obtained free on application to the Director of the Geological Survey, Washington, D. C.

Forthcoming Meetings

American Foundrymen's Association.—A. O. Backert, secretary, Penton building, Cleveland. Convention Sept. 7-10, La Salle hotel, Chicago.

American Hardware Manufacturers' Association.—F. D. Mitchell, secretary, 1510 Woolworth building, New York. Meeting being held jointly with the Southern Hardware Jobbers' Association at White Sulphur Springs, West Va., June 9-11.

American Institute of Electrical Engineers.—F. L. Hutchinson, secretary, 33 West Thirty-ninth street, New York. Next meeting at Detroit, June 23-26.

American Institute of Mining Engineers.—Bradley Stoughton, secretary; Albert Sauveur, chairman of Iron and Steel Committee, 29 West Thirty-ninth street, New York. Next meeting in Salt Lake City, Aug. 10-14.

American Society for Testing Materials.—Prof. E. Marburg, secretary, University of Pennsylvania, Philadelphia. Next meeting, June 30 to July 4, at Hotel Traymore, Atlantic City, N. J.

American Society of Civil Engineers.—C. W. Hunt, secretary, 220 West Fifty-seventh street, New York. Regular meetings at New York, first and third Wednesday of each month, except June and August.

American Society of Mechanical Engineers.—Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York. Next meeting, June 16-19, at University of Minnesota, Minneapolis.

American Railway Engineering Association.—E. A. Fritch, secretary, 900 South Michigan avenue, Chicago. Next meeting in March, 1915, at Chicago.

Association of Iron and Steel Electrical Engineers.—W. T. Snyder, secretary, National Tube Co., McKeesport, Pa. Next convention, Sept. 14-19, Cleveland, O.

Chicago Foundrymen's Club.—C. E. Hoyt, secretary, Lewis Institute, Chicago. Regular meetings at Sherman hotel, on second Saturday of each month.

Engineers' Society of Western Pennsylvania.—Elmer K. Hiles, secretary, Oliver building, Pittsburgh. Regular meetings, third Tuesday of each month.

Lake Superior Mining Institute.—A. J. Yungbluth, secretary, Ishpeming, Mich. Next meeting on Marquette range, in August, 1914.

National Founders' Association.—W. H. Barr, president. Lumen Bearing Co., Buffalo; J. M. Taylor, secretary, Chicago; A. E. McClintock, commissioner, Chicago. Next meeting in New York, in November, 1914.

New England Foundrymen's Association.—Fred F. Stockwell, secretary, 205 Broadway, Cambridgeport, Mass. Regular meetings, second Wednesday of each month, at Exchange Club, Boston.

Philadelphia Foundrymen's Association.—Howard Evans, secretary, Pier 45 North, Philadelphia. Regular meetings, first Wednesday of each month, at Manufacturers' Club.

Superintendents' and Foremen's Club of Cleveland.—Philip Frankel, secretary, 310 New England building, Cleveland. Regular meetings, third Saturday of each month.

Western Society of Engineers.—J. H. Warder, secretary, 1735 Monadnock building, Chicago. Regular meetings, first Monday of each month, except July and August, in Monadnock building.

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